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COMPUTERWORLD

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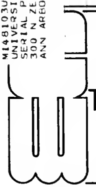

House To Hear Bell Bill

By Ronald A. Frank
Of the CW Staff

WASHINGTON, D.C. – Hearings on the Consumer Communications Reform Act of 1976 have been scheduled by the House Communications Subcommittee and will tentatively be held early this fall.

Three days of hearings on the proposed legislation will probably be held "late in September," according to a subcommittee spokesman. Although an official list of those who will appear has not yet been drawn up, common carriers will obviously testify since they are directly affected by legislation, the spokesman said.

It is also possible users will be given the opportunity to testify, he said, and those who are interested in providing their positions to the House subcommittee should contact Andrew Margeson, B-331, Rayburn House Office Building, Washington, D.C. 20515.

This is the fourth in a series of articles describing the efforts being expended behind the scenes to inform Washington legislators and others about the pros and cons of the Consumer Communications Reform Act of 1976, now pending in both houses of Congress.

While hearing plans are going forward in the House, there are no formal hearing dates in the Senate. The Senate's Communications Subcommittee has not made a commitment with regard to hearings on the Consumer Communications Reform Act and, a spokesman said, "it is really speculative to talk about the shape of any hearings or when they would come."

Asked whether users will have an opportunity to testify, the spokesman said Sen. Warren Magnuson (D.-Wash.) of the Senate Commerce Committee had stated that "all interested parties will receive a full and fair hearing." The communications group is a part of the Commerce Committee.

Asked how witness lists would be compiled when hearings are held, the Senate subcommittee spokesman said interested parties who had previously corresponded with the Federal Communications Commission (FCC) on the issue of competition would probably be contacted. But users interested in appearing or making their views known should write directly to the subcommittee, he said.

While the House group apparently will hold three days of hearings, most congressional experts agreed there is little time left in the current session for any detailed hearings on the act. They foresee an extensive debate on the bill and its issues in both houses of Congress beginning early next year.

Complicating the issue is the fact that the House subcommittee has a new chair-

(Continued on Page 6)

Congress Halts Bidding

SSA Doesn't Need More DP: GAO Audit

By Edith Holmes
Of the CW Staff

WASHINGTON, D.C. – The General Accounting Office (GAO) has finally released its audit of the Social Security Administration's (SSA) computer operations which indicates the agency's DP needs can be met by its existing facilities [CW, April 26].

And, as a result of the report, congressional pressure has delayed until mid-July the SSA's plans to award bids of up to $48 million for construction of a $69 million computer facility and an office building known as "Metro West."

Besides concluding the SSA plans for expansion are unnecessary, the GAO audit said the SSA failed to consider all available alternatives for expanding its DP operation in accordance with the specifications of the National Environmental Protection Act, recent correspondence between the GAO, Commissioner of Social Security James B. Cardwell and Rep. Charles A. Vanik, chairman of the Subcommittee on Oversight for the House Committee on Ways and Means, indicated here.

Sometime in the next three weeks, the House Government Operations Intergovernmental Relations and Human Resources Subcommittee, chaired by Rep. L.H. Fountain, will hold hearings to reevaluate the SSA's building and expansion plans, already approved by Congress.

Working at Half of Capacity

The correspondence between the GAO and the SSA which precipitated this reevaluation began with a March 26 letter from Gregory J. Ahart, director of the GAO's Manpower and Welfare Division, to Cardwell, providing the SSA commissioner with a draft summary of the GAO audit of the SSA's computer operations.

That audit indicated that, even on its busiest days, the agency's large-scale computer systems were being used at less than 50% of their available capacity.

In its explanation of the basis for these findings, the draft indicated GAO audi-

(Continued on Page 4)

FBI Asks End to CCH Plan, Cites Rebuff of Switching

By Nancy French
Of the CW Staff

SAN ANTONIO, Texas – The Federal Bureau of Investigation (FBI) has requested permission to terminate its Computerized Criminal History (CCH) program because information exchange cannot work effectively without a message-switching capability, U.S. Attorney General Edward H. Levi said in a speech here recently.

The FBI was denied permission to implement that capability by Levi last fall after congressional critics and others expressed fear that the message-switching system would concentrate too much police power within the FBI [CW, Nov. 19].

The CCH is a computerized file of criminal histories maintained by the FBI as part of its National Crime Information Center.

Deputy Attorney General Harold Tyler and the Justice Department's Telecommunications Systems Policy Board are studying the FBI request, but no one could estimate when a decision might be reached, a Justice Department spokesman said last week.

The CCH system was intended to centralize information on multistate offenders in a data bank in Washington, D.C. Records on single-state offenders would have been maintained by the states and the message-switching system, tied in with an index, would have switched inquiries from a requesting state to the

(Continued on Page 5)

User Claims His Univac 90/60 Can't Compare With Spectra 70

By Molly Upton
Of the CW Staff

TROY, Mich. – A user of a Univac 90/60 here is unhappy. Very unhappy.

"One does expect some problems in the beginning with new equipment, but this is a calamity," Peter J. Maraveleas, president of Medical Ancillary Services, Inc. (MAS), said recently.

The 90/60 cannot begin to keep up with the volume of work MAS processed on its RCA Spectra 70, he claimed. The problem is basically with the hardware, he said, although the Univac software is "lousy."

One of the principal faults of the system is the lack of software to provide for deleting items from files, he added.

Citing 70% downtime, Maraveleas has asked Univac to institute a trust fund so his clients can meet their payrolls because all their accounts receivable are "locked into" Univac computers.

Commenting on a letter Maraveleas sent to a Univac vice-president, a Univac spokesman said. "We have received Mr Maraveleas' letter, which we think is somewhat colorful, and we are working with him to investigate and, if necessary, resolve the issues he brings up."

MAS, which services hospitals and physicians, said it has lost several clients.

Maraveleas suspects the machine was released before Univac people outside of the top technical staff knew how to maintain it, he said.

Univac recently sent some design engineers here, and they are "making a big difference."

But MAS has been having difficulty with its 90/60 since February, Maraveleas said. The system was installed last September and ran in parallel with the Spectra 70 until January.

The firm spent two and a half years converting programs to the machine

(Continued on Page 3)

Money-Saving Device Not for Sale

By John P. Hebert
Of the CW Staff

SAN JOSE, Calif. – IBM has an experimental power-switching device that could save users money on certain types of leased equipment and conserve some of the nation's energy – but the firm has no plans to manufacture or market it

The "remote power control station" switch was developed and is currently being used in an IBM 370 installation at IBM's Product Test Laboratory here. However, it is "strictly an internal [company] device that we're playing with," an IBM General Products Division spokesman said.

With the device, IBM said, an operator can switch power selectively to peripheral equipment, turning on only those machines needed for a given job.

Toggle switches on a small, boxlike station are connected to power control cables individually serving the various machines, such as tape drives, card readers and card punches, it said.

The power-switching device acts as an intermediary between the peripherals and the CPU, which is the single source from which all power control signals emanate, it added.

An estimate of reduced energy consumption for an eight-hour shift in the lab here "adds up to something over 100 kilowatt hours," the spokesman said.

Asked what the effect from any similar device introduced into the marketplace would be on IBM's Monthly Availability Charge (MAC) plan, an IBM spokesman at the Data Processing Division in Armonk, N.Y., said no specific answer could be given because of the "many variables" presented by the fact it was an experimental device.

The MAC plan allows for a minimum usage of 178 hour/mo on the CPU and some peripheral equipment at a standard rate. The user is billed for any time the equipment is used beyond that point.

And, hypothetically, if such a device were introduced, the corporation would have to assess each peripheral individually at that time, he said.

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Calls Documents 'Smoking Gun'

U.S. vs. IBM Witness Says Never Again

By Edith Holmes
Of the CW Staff

NEW YORK – "No, I wouldn't testify if I had it to do all over again," Larry Welke, president of International Computer Programs, Inc. (ICP), said here recently about the part he played as a witness for the U.S. government in the trial of its antitrust case against IBM.

"I went into court thinking I would make a contribution that would benefit the judge in his understanding of the issues involved," Welke said. "I feel now that I misunderstood the purpose of a witness in that trial.

"Everyone is looking for a smoking gun. If this case has one, it's in the documents; it's not in the hand of any witness."

The 29th person to appear in court and take the stand on behalf of the Department of Justice, which is prosecuting the government's case, since the trial began over a year ago, Welke said he was asked and agreed to participate as a witness with little or no preparation.

Not knowing the rules or conformities governing the actions of the parties, the judge and a witness, the ICP president said he felt frustrated while on the stand and "used" by the time it was all over.

A witness "merely serves as a conduit for both sides. The parties simply use the witness to carry their particular message to the judge," he added.

While Judge David N. Edelstein, who is hearing the case without a jury, "made a point of telling me I was my own man with no obligation other than to tell the truth," Welke said the judge seemed to have no sense his behavior and expections could affect a witness and the quality of his testimony.

More Preparation by IBM

Though he was the government's witness, "IBM probably did more to prepare me than the Department of Justice did," Welke said. He described his lack of preparation as "probably the principal shortcoming" of his participation in this action.

The Justice Department did little more than tell Welke to wear a white shirt, a conservative tie and to look neat, and the ICP president said he had to ask for even that advice.

By contrast, IBM counsel suggested he review depositions he gave in June 1974 and again in September 1975.

Welke noted that, following his initial examination by the government in court, attorneys for the defense pointed out contradictions between his testimony before the judge and his deposition testimony.

"IBM counsel never told me to review the contradictory passages in my depositions; it just suggested it might be helpful," Welke recalled, adding "that's the kind of thing you might think the Department of Justice should have done."

Welke pointed out other differences between the preparation offered him by the government and that provided by IBM. Each day, both parties would go over the questions they planned to ask him in court.

"If IBM counsel didn't like my response to a question during these sessions, it wouldn't ask me that question once I was on the stand," Welke said. But the Justice Department attorneys asked him the same questions on the stand that Welke had answered to their dissatisfaction in the preparation meetings, he noted.

"The government people never said directly they didn't like my responses to some of their questions," he said, "but that was obvious both in the preliminary meetings and in court because they kept coming back to the same subject area and asking the questions again in slightly different ways."

Welke thinks the Justice Department questions were sometimes unclear, he said, because they were questions handed up to the government attorney conducting the examination by Alan McAdams, the economist consulting the Department of Justice in this case.

From everything he saw, Welke said, he thinks "McAdams is running the strategy for at least this part of the trial."

In conversations incidental to his participation as a witness, the ICP president said he feels the government's overall strategy in regard to witnesses is "to keep them on the stand for a long enough time so the judge will get to know them well – at least well enough to believe their opinions about the computer industry."

Welke also commented on the Justice Department plan to have McAdams take the stand as its final witness. He learned McAdams will use all prior testimony to justify his testimony before Edelstein.

"McAdams will be like the pitcher who comes up to bat at the end to win his own ball game," he said.

An observer watching the proceedings while Welke was on the stand remarked on his lack of preparation. "You know, these people are being asked to come do their civic duty by giving a pint of blood. Then they get on the stand and they're asked to donate a kidney. That's an entirely different matter," the observer said.

Court Paves Way for FCC Plan Eliminating DAA Requirement

By Ronald A. Frank
Of the CW Staff

ABBINGTON, Va. – A U.S. Court of Appeals ruling made here last week will allow users to directly connect noncarrier data communications equipment to the telephone network.

A three-judge panel of the U.S. Fourth Circuit lifted an earlier stay order which had blocked the start-up of a Federal Communications Commission (FCC) program to connect customer-provided equipment without Bell Data Access Arrangements (DAA) [CW, May 10].

The latest ruling means users will be able to connect noncarrier equipment, such as modems, to the network if the equipment has been certified by an independent engineer and registered with the FCC.

The certification/registration procedure was designed to ensure customer-provided equipment contains protective circuitry generally equivalent to that contained in the DAA. This circuitry prevents electrical harm from occuring to the network.

An FCC spokesman said certified and registered devices can be connected to the network almost immediately – as soon as the commission issues the necessary order putting the interconnection program into effect.

The Bell System has fought a long regulatory and legal fight to prevent direct connection of customer-provided equipment to the telephone network.

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Data Entry Backlog Cited in Death of Motorcyclist

By Nancy French
Of the CW Staff

WORCESTER, Mass. – A high-speed police chase ended in death here recently for a teenager riding on what was thought to be a stolen motorcycle.

When it was all over, however, authorities found the cycle had been legally registered three weeks earlier, but the record had not yet been entered into the Registry of Motor Vehicles' computer system.

The registry uses a keypunch data entry system, and has a backlog of at least three weeks, according to Morton Carter, a registry spokesman.

Besides the fact that information about the current registration was not available to police officers in their patrol car, a report from the state's telecommunications network told them a Honda cycle with the same registration number had been stolen in 1973 and never recovered.

It was almost midnight when police in a squad car saw 18-year-old Scott Elms of nearby Holden ride his motocycle through a red light on Main Street, according to their report. Police radioed the vehicle's license number to a dispatcher at the Worcester Police Department who queried the Law Enforcement Agency Processing System (Leaps) operated by the state's Department of Public Safety.

The Leaps inquiry accessed the state's missing persons/stolen property data base as well as the Department of Motor Vehicles' computerized files, according to Deputy Halstead Taylor, spokesman for the Worcester Police Department.

The Leaps data base reported a Honda similar to the one Elms was riding had been stolen in 1973. However, the registry file indicated Elms' registration number had last been issued in 1974 and no current registration was listed.

"People made telephone calls to the agency that reported the vehicle stolen, but apparently didn't get any answer – it's a gray area on my report," Taylor said.

But everything else seemed to fall into place, he said. "It was a Honda, it was reported stolen and a guy was trying to get away from us," he said. "The net result was that we had to take the thing as gospel, especially when we were in the middle of a chase."

The information was radioed to the squad car, which continued to pursue the fleeing motorcycle. The chase ended in Holden, where Elms went off the road, crashing into a utility pole.

The youth was pronounced dead on arrival at Holden District Hospital, the police report said.

A day and a half later Worcester police learned Elms had a valid registration, but it wasn't found until registry personnel manually searched their files.

Taylor said he didn't understand why the registry doesn't have data entry facilities in each district or regional office so registrations can be entered as soon as they are received.

User of Univac 90/60 Unhappy

(Continued from Page 1)

under the supervision of Univac, Maraveleas said.

The programs work, he added, because they were thoroughly tested individually before the cutover was made. The system survived the parallel operation because there wasn't much of a workload on it, he said.

In February, MAS' system was down for 17 days. Univac doesn't know what was wrong with it, Maraveleas said, but it replaced the controller and that seems to have helped.

To extricate MAS from its bind, Univac offered to put some of MAS' work on its two 90/60s in Blue Bell, Pa. But "all three machines are unable to compete with one lousy Spectra 70," he said.

Univac represent the 90/60 as being able to process in 10 hours a day the work it took the Spectra 70 16 hours a day to do, according to Maraveleas.

However, he said in the letter to Univac Vice-President Charles Grunman, "reality demonstrates that a 90/60 on my premises and a 90/70 located at your service center in Blue Bell, both operating seven days a week, 24 hours a day, are not able to accomplish what the Spectra performed on a 16 hour per day, five days a week schedule."

Also, Univac told him there would be other 90/60 users in Michigan, but these failed to materialize, Maraveleas stated.

By March, Univac indicated additional memory and a disk drive would improve output, he said. But the disk drive did not become operational until May 12 and the additional memory was disconnected because it was "inoperable," he said.

Then Univac determined an upgrade to a 90/70 with four channels was needed. This machine was supposed to have been installed in late May, he said, adding the computer room was expanded to accommodate the system at considerable cost to meet the date given by Univac.

Recently, the team in Blue Bell working on the MAS situation unloaded half of the data base and reloaded it after cleaning the dead accounts. A job that was to have taken 60 hours took 10 days because of hardware failures, Maraveleas said.

The cleaner base has improved the system's speed, he observed, and the same procedure is being done here.

In his letter to Grunman, Maraveleas asked, "Do you call reasonable hardware stability: 70% downtime for five consecutive months, the substandard performance of two computers located at Blue Bell and one on site at this company?

"Do you call reasonable software capability: the continuous restoring of and nothing more when, by the grace of God, one out of three computers is functioning?

"Do you call software efficiency the inability to delete records under any circumstances?"

As consequences of difficulties with the 90/60, Maraveleas said, MAS has incurred loss of new prospects, loss of existing clients, paralysis of MAS management and systems department, demoralization and exhaustion of personnel and a 400% increase in MAS' accounts receivable, resulting in the total depletion of his firm's resources.

Maraveleas is unaccustomed to downtime – the Spectra 70 was down only about four hours in five years, he said.

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Audit Finds SSA Plans to Expand DP Not Warranted

(Continued from Page 1)

tors, working with independent consultant Mike Morris and Boeing Computer Sytems' System Analysis and Resource Accounting package, determined 11 of the agency's 13 IBM 360/65s "are capable of handling more than twice the load that is currently assigned."

SSA system management information was unusable for the remaining two 360/65s, it noted at the time. However, information GAO later received indicated they,. too, could sustain a similarly increased workload.

As with the 360/65s, the GAO audit draft stated the agency's two 370/65s and two 370/168s could also support more than double their current workload.

"Only in the case of the 165s would any reduction in present abend rates be needed to double the total load," the draft said.

In addition to these conclusions, the GAO noted, "the large-scale systems are evidently only manned for 15 of the available 21 shifts per week, although some of the available six shifts on Saturday and Sunday are worked in a few of the complexes.

"These unmanned shifts represent an additional reserve capacity of up to 40% for all systems."

Reasons for Underutilization

Why such underutilization? The analysis led the GAO to conclude "the entire structure of the operation is tailored as though the systems in use were of the [IBM] 7090-1410 or 'Second-Generation' series."

The auditors said they noted "an extreme lack of knowledge of the capabilities of the equipment, general indifference toward completion of necessary tasks, only superficial understanding of work to be done and virtually no communication between operations personnel from one shift to the next."

The GAO team frequently observed the agency's 17 large-scale systems being placed in a "stop" condition and left unattended by operations personnel. This seemed to be the normal way to change shifts, the GAO commented, noting systems were also stopped to wait for work from other systems.

Organizationally, the system complexes each seemed dedicated to one or very few major users. "This results in almost no sharing of work between complexes, even though one of two adjacent complexes may be extremely busy while the other is completely idle," the GAO said.

The agency's Bureau of Data Processing, "in effect, provides total systems to the user to be used at his discretion rather than providing computer service to all users based on the total of all computer resources available," the auditors stated.

Finally, the draft of the GAO findings noted that, in many cases where the output of the large-scale systems was placed on tape, these tapes were moved to the medium-scale systems to be printed.

"Carrying tapes from one system to another for printing was typical in the late '50s and early '60s; it is a totally unnecessary operation with large-scale systems of the type installed at SSA."

In a response on April 16 to the GAO's conclusions, Cardwell called the GAO and Morris analysis "an indicator of *possible* underutilization of present CPU and/or peripheral equipment."

He suggested that a further analysis of the computer operation be initiated by an outside organization and indicated that "if the job is to be done properly," such an analysis could take as long as a year and a half.

In the meantime, Cardwell told Ahart, the SSA has determined its best choice in acquiring further equipment is to go ahead with plans to install four 370/168s now on order [CW, April 12] in November while concentrating on determining how many of the present 360/65s might be eliminated.

Cardwell promised the agency would initiate no additional significant acquisitions, including those proposed in the 1977 budget, until further analysis of the computer operation is completed.

Because the agency plans to proceed with the acquisition of the four 370/168s, it must also go ahead with the construction of the $2.3 million temporary facility in which to house these machines, the commissioner concluded.

Similary, Cardwell argued, the $69 million computer facility must be built without delay if the SSA is to modernize its DP operations – a process that necessitates "a complete overhaul [of equipment] from top to bottom."

SSA efforts to improve management and staff training and development received the promise of "an outside expert in this general field to come in and work under the associate commissioner for program operations over the next several years to make improvements both in staff development and in the general area of systems management."

Cardwell also said "immediate steps" would be taken to improve physical security and to upgrade the training of security personnel.

Reply From Ahart

On May 14, Ahart responded to Cardwell, hitting hard on the relationship between improving management and staff training and the security of the SSA's DP operations [CW, May 24].

Ahard also challenged the agency's "inadequate" consideration of modifications to its existing DP buildings in lieu of building a new computer facility.

Noting that "industry sources consider incompetency and carelessness of DP personnel to be the most significant threat to the security of a DP installation," Ahart urged the SSA to adopt staff training and development that takes security into account.

"We feel that elimination of such potential security threats cannot be accomplished simply by relocating the entire computer operation to the secure environment of the new building," he said.

While security has been a major justification for building the new computer facility, Ahart said the SSA has been inconsistent in similar concern for its present building, which could be used for four to six more years even if the new building goes through.

In January 1975, the SSA turned down a proposal to install an automated security system in its existing facility at a cost of about $300,000, Ahart recalled.

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Rules No Criminal Intent Evident

Judge Throws Out Indictment Charging IBM Rigged Bid

By Nancy French

Of the CW Staff Staff

JERSEY CITY, N.J. – A Hudson County Superior Court Judge here has dismissed the indictment that charged IBM and five individuals with conspiring to rig the bid for this city's computer system in IBM's favor [CW, Oct. 8].

The law allegedly violated was the New Jersey Public Contracts Law, which became effective in July 1971.

Judge Thomas S. O'Brien found there was no evidence to show criminal intent and ruled the indictment returned last September was fundamentally unfair. He said further the indictment violated due process.

Three former Jersey City officials were involved – Joseph Cahill, finance director; Walter Happell, director of DP services; and Peter Korn, business administrator.

Also indicated were IBM itself; Roger Forsyth, an executive of the First Jersey National Bank who acted as a consultant to Jersey City DP officials on the contract; and Eugene Josephs, an IBM sales representative.

The indictment charged IBM and the five individuals conspired to thwart free, open and competitive bidding in order to win the contract for rental of a computer system. The contract was valued at $13,860/mo.

The indictment also charged Burroughs Corp. and Honeywell Information Systems were excluded from bidding on the system.

Using as part of its evidence a report from the Division of Community Affairs indicating that all DP equipment must be put out to bid, the prosecutor attempted to show the individuals involved intended to violate the law.

IBM counsel, from the firm of Riker, Danzig, Scherer and Debevoise of Newark, used an opinion from the Legislative Services Bureau in Trenton to show services don't have to be competitively bid.

The corporation's counsel also produced as evidence an article from the *New Jersey Law Journal* which called the public contracts law "confusing, ambiguous and hard to apply."

Defense counsel also attacked the indictment in its pretrial brief because, it said, the indictment merely charged the defendants conspired to pervert due administration of the public bidding laws without attempting to show the procurement had to be bid publicly.

The indictment also did not specify how the bidding procedures used failed to comply with the statute, IBM counsel said.

In addition, the counsel showed 59 government entities covered by the public contracts law have awarded computer contracts without competitive bidding since adoption of that statute in 1971. Those that negotiated procurements rather than bidding them ranged from the Bergen County Vocational School in Paramus in 1972 to the John F. Kennedy High School in Willingboro in 1975, the pretrial brief said.

Without going so far as to say the law was "vague," O'Brien indicated there was no evidence to show the officials had clear intent to violate any statute, according to John McLaughlin, a spokesman for the prosecutor's office.

FBI Asks Permission To End CCH Program

(Continued from Page 1)

state where the criminal record was maintained.

However, the FBI began implementing the system by collecting duplicate computerized criminal histories, which drew objections from constitutional rights advocates who saw the system as the beginning of a national police force.

Since its inception, the CCH file has grown to 800,000 records, with eight states participating.

No Action by Congress

It had been Levi's expressed view the constitutional issues raised by the FBI proposal for a message-switching system should be resolved by Congress before he gives the final go-ahead, and thus a decision was deferred.

However, Congress has taken no action on the matter to date – a fact which Levi finds "disappointing," he told a meeting of state attorneys general.

The final decision on the FBI's request to terminate the system will be "difficult because of the potential value of the Computerized Criminal History program and, particularly, because of the steps which some states have taken in reliance upon the development of a national program," Levi said.

"If the [FBI's] request to terminate its program is granted, perhaps a decentralized Computerized Criminal History program will be implemented by another institution," he said.

The National Law Enforcement Telecommunications System (NLETS), a system funded and operated by state law enforcement agencies, has been suggested by some as an alternative.

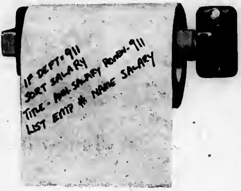
In response to the Levi speech, NLETS President Richard Burns said in an interview the NLETS Board of Directors "is on the record in support of the FBI's maintenance of computerized criminal histories."

However, the group is slated to meet again at the end of this month and recent developments may produce a change in their attitude, Burns said.

Regardless of how the issue is resolved, legislation is important, Levi said.

"Crime is at an intolerable level" and "the victims of crime will be ill-served if, in seeking our common goals, we unnecessarily compete, rather than cooperate, or if we permit inevitable controversies to prevent us from making difficult decisions together," he said.

"Federalism is one of the great inventions of our Constitution, and we have a strategic opportunity and responsibility to make it work," he said.



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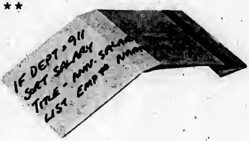

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IBM-Made Punch Cards Blamed in Primary Miscount

By Catherine Arnst
Of the CW Staff

CONCORD, N.H. – An attempt to switch from hand-counted ballots to an automated system resulted in an erroneous vote tally in New Hampshire's Presidential primary, this city discovered recently.

A Computer Election Systema (CES) precinct ballot-counter system tested in one ward here during the February primary miscounted about 29 votes because some of the punch cards manufactured by IBM were cut short..

Concord has been reviewing its voting procedures since the Durkin-Wyman senatorial race that took a year to resolve because of miscounted ballots. The CES system was being tried out in Wsrd 5 prior to being submitted to the New Hampshire Ballot Law Commission for certification for state use.

"The system was given about as rigorous a test as can be given," Mayor Martin Gross said. "There were 228 positions on a ballot."

But the corner cuts on some of the IBM ballots were not made to the specified size, and the system did not count those ballots at all.

The miscount wasn't discovered until May 14 because part of the test for the system required the ballots be counted on a different system after an impoundment period for the ballots was over.

It was then discovered some of the ballot cards were cut .026 of an inch too short. This resulted in President Gerald R. Ford getting 29 more votes and Ronald Reagan getting 12 more than the original count.

The results of the primary were not affected by the miscount at all, Gross said. Ford went from 227 to 256 votes in the ward and Reagan went from 110 to 122; the delegate count for each remained unchanged.

The short punch cards threw the ballot counter off because the system is set up to count a ballot even if it is not inserted properly in the machine by keying on the corner cut. Because that cut was wrong, this fail-safe feature failed.

Only Republicans Affected

Only Republicans' ballots were affected because, as part of the test of the system, Republican ballots were inserted into the counters in different positions to test the corner cut fail-safe method, while Democratic ballots were all fed in the same way.

CES was notified by IBM on Feb. 20 that faulty cards had been sent out, but the CES regional office which handles Concord claimed it was not notified until after the primary, according to a local newspaper.

The salesman for CES did not notify the city of the faulty punch cards because he "assumed" none of those cards had been used, the newspaper said.

Gross is still satisfied with the performance of the system: "It had a high degree of public acceptance. The public found it easy to use and easy to learn how to use," he said.

Questionnaries were handed out at the polls concerning the CES system and, of the 450 returned, only 30 were unfavorable, Gross said.

In addition, Ward 5 finished counting its ballots two and one half hours earlier than any other ward in the city without bringing in any outside help, Gross said.

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House Sets Hearings On Bell-Fostered Bill

(Continued from Page 1)

man, Rep. Lionel Van Deerling (D.-Calif.), and the Senate subcommittee is expected to be headed by Sen. Vance Hartke (D.-Ind.) since the present chairman, John Pastore (D.-R.I.), plans to retire at the end of this session. Hartke is one of the Senate sponsors of the legislation.

More than 80 bills have been introduced in the House by about 115 representatives and about 10 Senators have introduced legislation in the Senate. All are versions of the original bill introduced by Rep. Teno Roncalio (D.-Wyo.) three months ago [CW, March 22].

Although many members of Congress have sponsored some form of the AT&T backed legislation, most have been hesitant on making public statements on the merits of the pending bills. Many have stated they introduced the legislation mainly because the issues involved should receive a hearing before Congress.

In order to expedite early hearings, several congressmen have introduced resolutions calling for consideration of the issues in the Consumer Communications Act. One such resolution, introduced by Rep. James Delaney (D.-N.Y.), called for hearings to be commenced ss soon as possible by the House committee with appropriate jurisdiction "to consider and determine the future telecommunications policy of the nation.

"The question of whether [recent] FCC decisions will lead to increased competition. . . to the betterment of the consuming public or alternately result in higher telephone rates and poorer service for 67 million households is a matter of national policy and should be reviewed by Congress," the Delaney resolution said.

Bell Visits

Meanwhile, Bell System representatives have been working to reach each member of Congress with a personal visit. A recent article in the *New York Times* said chief executive officers from the 23 Bell operating companies had visited each member of Congress to spread AT&T views on the proposed legislation.

Each Bell operating company has formed an "industry committee" for the express purpose of visting members of Congress and discussing the legislation, a Bell spokeswoman said. The committees also include officials from independent phone companies.

Thus far the industry committees have visited all members of the Senate and "we are endeavoring to contact all members of the House," the Bell spokesman said. In many cases, the visits are being made by the president of the legislator's local Bell operating company, she added.

A random check of Senate staffs confirmed many had been visited by executives from local Bell operating companies. "There has been extreme pressure from the telephone companies to get some favorable action. Their lobbying effort is intensive," one Senate staff member said.

Use of Encryption Algorithm Urged

Security Called Major Task for National EFT System

By Toni Wiseman
Of the CW Staff

NEW YORK – The emergence of a national electronic funds transfer (EFT) system is inevitable, so the task now facing the computer industry is to make that system a secure one, David Kaufman of Systems Development Corp. said here recently.

"Unless planning for security and for operation on a national scale begins now, development of an efficient and secure future system may be impossible," he told a session at the National Computer Conference.

Kaufman made several predictions concerning the operation of a national EFT system. First of all, he said, all funds transfer transactions will be initiated by a customer using a bank card.

Completion of the transaction will require three types of information to be entered into a remote service unit (RSU) or transaction terminal – a personal account number, financial institution indentification and possible other data such as credit rating and card expiration date.

The cardholder will then enter his personal identification number (PIN), and the clerk will enter transaction-type information.

The three operational requirements for a national system – reliability, expandability and security – are all possible with current technology, Kaufman said.

This means the system must provide continuous service, probably through the use of backup sites, if the host processing center (HPC) is down, he said.

Six security principles should be incorporated into any EFT system, Kaufman said.

First, the PIN should be known only by the cardholder since it is a potentially powerful tool for providing EFT security and the only current means for positive identification of the cardholder, he explained.

In addition, there should be no way to derive the PIN from information on the card.

Fourth, to ensure user privacy, there should be no unauthorized exposure of personal data, Kaufman said.

To ensure transaction integrity, transaction data should not be subject to unauthorized alteration, he stated.

Finally, all transaction requests and authorizations should require positive identification of authorized access at their destination.

Cryptographic Possibilities

Cryptographic techniques may provide an answer to many of the security problems facing EFT systems, Kaufman suggested.

In the simplest form of an EFT network, a transaction processor (TP) would link RSUs to the rest of the system, manage funds transfer requests initiated at RSUs and perform the one-way PIN transformations, he said. A switch would then interconnect HPCs and TPs.

For security, Kaufman proposed the use of network cryptographic devices (NCD) using the National Bureau of Standards' data encryption algorithm.

NCDs, he said, do not presently exist, but are technically viable. Assuming the existence of the devices, however, NCDs could maintain a fully interconnected network, interfacing TPs and HPCs to the switch.

"By using a unique key, each NCD can protect the communications path to any other NCD in the network," he said.

Thus NCDs would be used to authenticate the source of HPC and TP messages. Enciphering and deciphering of messages by NCDs would be based on secret values, or keys.

An NCD could not decipher a message unless it knew the key used to encipher the message, Kaufman noted.

He envisions each NCD maintaining a unique key for communicating with each of the other NCDs in the EFT system.

For example, if TP_1 attached to NCD_1 sends a message to HPC_2 attached to NCD_2, the key used by NCD_1 to encipher the message would be known only by NCD_1 and NCD_2.

When NCD_2 received the message, NCD_2 could thus be sure the message came from NCD_1. The source of the message which arrives at HPC_2 would therefore be TP_1, he explained.

Services Sector Seen Benefiting From EFT

NEW YORK – There is no commonly adopted viewpoint on electronic funds transfer (EFT) systems in the computer services sector, but there are many opportunities for this sector to take advantage on them, William Hutton, vice-president of corporate marketing for Automatic Data Processing, Inc., told a recent National Computer Conference audience here.

"We talk about EFT as being a brand new thing which is drawing on the horizon, but in reality it has been around for years," he said, noting the federal wire used to transfer funds between banks is essentially an EFT system.

"The new aspect of the technology is its intended proliferation," Hutton stated.

The first thing the services sector must do is determine what it really means by electronic funds transfer, he said. Check verification, for example, should not be considered a true element of an EFT system since it encourages the use of checks rather than discouraging paper handling, he noted.

There are four basic motivations for the implementation of EFT systems, Hutton stated. These include the elimination of reduction of float in banking systems; the reduction in operating costs, primarily in banking systems, which could be passed on to consumers; the prospect of customer benefits in terms of speed and services; and increased business opportunities for consulting software and hardware firms.

"Only the last segment is currently making any money on EFT systems," he stated.

DP has a ubiquitous terminal condition.

A special report on *Data Communications Terminals* in the July 26th *Computerworld*.

The dollar value of the U.S. installed base of both general and special-purpose terminals should increase to $25 billion by 1980, *$20 billion of which will be shipped in the next five years,* (based on estimates by International Data Corporation, the world's largest EDP market research firm). Clearly, more users than ever before are relying on terminals to provide solutions to complex problems, while increasing the utility and accessibility of their computer systems.

Computerworld will present a special report on Data Communications Terminals in the July 26th issue, including teleprinters, CRTs and intelligent terminals. Edited by Ron Frank, this supplement will cover a variety of topics of importance to data communications users, with application stories and tutorials throughout.

For example, we'll report on how new carriers and carrier services might affect the way terminals are used. We'll look at what applications require terminals with "intelligence" - i.e., processing logic and memory - and show you some of the best ways to make use of this hardware. We'll investigate what's being done to make the terminal environment easier to use. This includes items on recent teleprocessing software enhancements and new hardware features, to name a few. In addition, we'll report on where terminals are headed, and analyze what's been happening to the cost of terminals.

If you're involved with data processing, this is one subject you may want to be very familiar with. Don't miss it. It's in the July 26th *Computerworld*. If you're a terminal manufacturer, you should advertise here. Don't miss the July 9th ad closing. Call your *Computerworld* salesman for more details. Or call Judy Milford at (617) 965-5800.

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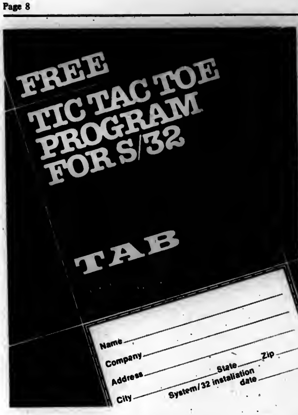

Ninth-Grader Snares Top Prize at NCC With Program to Model Spread of Fire

NEW YORK – The choice wasn't an easy one. Visitors to this year's National Computer Conference (NCC) Student Computer Fair, called Compyouter, said it was the best such exhibit by young people they had ever seen.

But, in the end, the best entry had to be selected, and that award went to Walter Freitag Jr. for his computer modeling of the spread of fire.

A ninth-grade student from Dresher, Pa., Freitag reasoned that while the spread of fire in a structure is complex, it is also predictable according to the shape of the building and the thermal properties of the materials used in its construction.

He knew that if this information could be incorporated into a computer program, a prediction of the way fire moves through a structure could be made.

Programming in Basic on a Univac 1108 time-sharing system, Freitag developed a fire-spread model consisting of a series of eight superimposed three-dimensional matrices. For the purpose of his project, he limited the number of elements included and so minimized the size of the matrices.

Each building material in the program has four values associated with it. These include the total energy the material releases when burning; the temperature at which the material ignites; the heat capacity of the substance; and the material's combustion rate, or the number of time units it takes to "burn out," Freitag explained.

Each of these four pieces of information is stored on a separate matrix in the student's program. Another matrix contains a pictorial representation of the structure to be tested.

Series of Cycles

During a run of the program, Freitag first inputs the matrix coordinates where the "fire" is ignited. "Then, in a series of cycles, each cycle representing one time unit, the program uses the data stored on the matrices to predict the extent of the fire's propagation," he said.

"At regular intervals, the program then prints out the three-dimensional structure matrix showing the 'burning' and 'burned-out' areas of the structure," he added.

Walter Freitag Jr. demonstrates his prize-winning computer project to Gerald G. Probst, Univac president, at the recent NCC.

Freitag plans to add more variables to his model and noted that if the program is to have practical application, it must include elements like air flow and oxygen depletion.

Freitag envisions the ideas in his model being used to allow firefighters to recognize dangerous firetrap situations in existing buildings, to plan new buildings to be as safe as possible and to develop a plan for extinguishing a fire as quickly as possible once it has started.

Freitag began programming in fifth grade when his older sisters brought home a textbook dealing with DP and a science teacher invited him to try his hand at writing an averaging program.

With the exception of a nine-week elective offered by his junior high school, most of what Freitag knows was self-taught.

His prize was the Altair Mits 8080 minicomputer kit. Freitag said the first thing he plans to do with the 8080 is learn how to build and use it.

He isn't sure he'll be able to use it as much as he thinks it should be, so Freitag may lend it to his junior high school.

Afips Presents Harry Goode Award To L.G. Roberts, Telenet President

NEW YORK – The American Federation of Information Processing Societies (Afips) this year gave its Harry Goode Memorial Award to Dr. Lawrence G. Roberts, president and chief executive officer of Telenet Communications Corp.

Presented during a special session at the National Computer Conference here recently, Roberts received the award "in recognition of his contributions to the architectural design of computer-communication systems."

Afips President Anthony Ralston cited Roberts' "leadership in creating a fertile research environment leading to advances in computer and satellite communications techniques."

Ralson also praised Roberts for his role in the establishment of standard international communication protocols and procedures.

Finally, Roberts received the award for his accomplishments in the development and demonstration of packet-switching technology and the networks which grew out of that work.

Established in 1964 to annually honor and encourage outstanding contributions to the information-processing field, the award is named for Harry Goode, a pioneer in computing and a major force behind the federation of associations, who died in an automobile accident before Afips was formally chartered.

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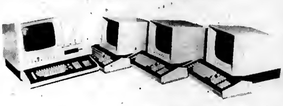

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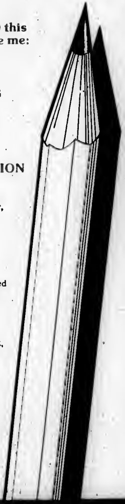

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- **60** Consultant
- **70** Lawyer/Accountant
- **80** Librarian/Educator/Student
- **90** Other ______

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Editorials

Naive, Yes; Wrong, No

Anthony Ralston, the outgoing president of the American Federation of Information Processing Societies (Afips), admitted he might be naive in his recent call for professional societies to get involved in social issues [CW, June 7].

That plea was in many ways naive, but it clearly pointed to a new direction needed for the societies.

Too often, the practioners of this trade ignore the larger social consequences of their work and concentrate on the more limited technical question. The Universal Product Code was a good example of putting a technical development on the market without any consideration for the consumer.

Many other issues – monopolization in the industry, privacy and so forth – fit into this category.

But Ralston is naive in feeling technical input will help society at large sort out the problems. The issues raised have much less to do with technical questions than they do with questions of sociology and public policy.

Technicians should not limit themselves to a role in the debate solely as information providers, but should take public policy stands.

There will be disagreement on the proper application of technology among the technologists, but only a full debate of the deeper sociological questions involved in technology will be useful to the public policymakers.

Printer City

The recent National Computer Conference (NCC) reminded many of a printer warehouse. There are no official totals of such things, but attendees agreed it was easy to count 30 printers on the floor without any trouble – and there were probably more.

To DP managers concerned with providing an ever-increasing flow of printed CPU output to corporate users, the changes in printer technology bring help in several ways.

It is no secret that the printer – whether attached to a CPU or a terminal, is a vulnerable device. Any electromechanical unit which is almost constantly in motion is subject to stress and wear.

But the technology is changing and, as it does, the reliability is improving. Printers are relying less on servo motors and potentiometers and more on electronics, for example. And the electronics are being packaged on modular circuit boards which can be stocked and even replaced by the user if a maintenance man is not within a reasonable distance.

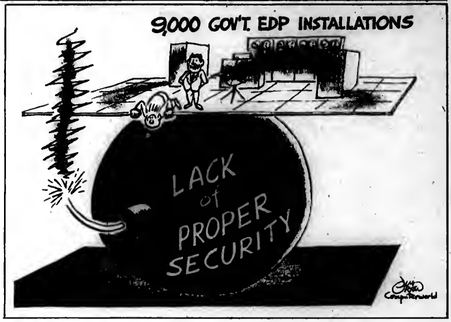
The print heads are changing too. The introduction by IBM of an ink jet printing unit for the System 32 is typical of the new methods being found to put a character onto paper.

Even for users who want to upgrade their systems, there is a benefit. The addition of a faster printer to a minicomputer-based system or a mainframe often can improve output at relatively low cost.

Almost every DP installation is faced with increased output printing loads as the number of users accessing a CPU goes up.

Improved printing devices may not have as much glamour as the latest CPU number crunchers or double-sided floppy disks, but they serve a vital need.

When reports to management are late because of printer malfunctions, the entire staff is blamed. The new breed of printers may help to keep that output flowing on time.



'We Just Ignore It, Hoping It'll Blow Away . . . '

Letters to the Editor

Grosch Picture of ACM Election Falsely Divides Membership

Although perhaps attributable to his natural exuberance at being elected president of the Association of Computing Machinery (ACM), Herb Grosch painted a picture of the ACM election which was false where it was not misleading and which, moreover, set an unfortunate tone for his administration by a crude attempt to divide the ACM membership into establishment and non-establishment types [CW, May 31]. We two members of the three current ACM nominating committees think it is necessary to set the record straight.

We deny the existence now or in the past of an ACM establishment. The variety of people who have held office, particularly in recent years, is ample proof of this.

Our disagreements with Grosch on ACM policy and directiona had nothing whatever to do with our failure to support his nomination for president. These disagreements with him are considerable, although, as Herb well knows, one of us, at least, is much closer in viewpoint to him on his human issues than to either of his opponents in the election.

In any case we saw our task to be one of nominating the most able, most deserving candidates quite aside from agreements or disagreements with us. One most important qualification, we believe, was previous service and willingness to work for ACM.

Herb correctly outlined the ACM positiona he has held. But in none of these, most particularly as vice-president, has he been a hard-working, effective contributor. As he noted himself, he has "never been addicted."

That was the one and only reason we did not support his nomination for president; we didn't think he deserved it.

Far from being "afraid to risk" nominating Dan McCracken for vice-president, he is esteemed by us and was high on our list of potential candidates. He was not higher only because he is currently serving his first term on council and hia previous service to ACM, while significant, falls far short of that of the two candidates we nominated.

Finally, Grosch accused one of us of backing one of his opponents in the election. That was flatly false. Not only did neither of us play any role whatever in electioneering, but the one of us who was approached urged others not to electioneer either.

George Glaser
Anthony Ralston

ACM
New York, N.Y.

For another view, see commentary on Page 12. Ed.

Data Past

Five Years Ago
June 23, 1971

WASHINGTON, D.C. – The problem of individuals' privacy was seen as serious and urgent by congressmen, labor and management leaders, students, law enforcement officials and academicians at a three-day series of sessions sponsored by the Transporation Institute and the AFL-CIO Maritime Trades Department.

– – –

BOSTON – Nearly half of Massachusetts' $2 billion budget was spent on public welfare and a team of unemployed computer technicians blamed poor management of DP resources for much of the cost runaway after conducting a four-week study of the state's Welfare Department's computer usage.

Eight Years Ago
June 19, 1968

WASHINGTON, D.C. – The first patent for a computer software program was issued by the U.S. Patent Office to Martin Goetz, vice-president of Applied Data Research. The issuance represented a landmark after the withdrawal earlier this year of the proposed "Section 106" designed to outlaw patenting of computer programs. Goetz filed the application on April 9, 1965 for a sorting aystem.

– – –

WHITE PLAINS, N.Y. – IBM offered Call/360 Basic, a new time-sharing service which waa cheaper and more flexible than its Quiktran service and, in a parallel announcement, inaugurated Call/360 Datatext, an improved version of its subscriber text-editing service. The offerings were indications IBM was going after the time-sharing utility market in earnest.

Calif. Privacy Act Costs Higher

In the issue of May 17, I was correctly quoted as saying General Electric'a (GE) costs to comply with my California Privacy Act would be $64,000. This number represents continuing annual costs and does not include the start-up or one-time costs to comply with the act.

I have recently been informed by GE that this number should be $76,000 and that this representa the annual ongoing costs for all the GE components affected by the act.

Mike Cullen
Chairman, Joint Legislative Audit Committee

California Legislature
Sacramento, Calif.

Japan II

One of the pleasant things about my conversations at Fujitsu was the chance to recapture, in a fourth-generation environment, many of the earlier excitements of the American computer scene. That's not intended to imply a ten-year lag, or anything of the sort; in many areas such as bank networking, seat reservations on the terrific railroads, and digital services via pushbutton telephone, our Japanese *confreres* are ahead of us. But in other areas we are only beginning to find out about what they have already done, and done very well. Fujitsu systems people are only a year or two behind current American practice, and still working to close the gap. Applications vary according to field; because of my old personal involvement with space activities I was deeply interested in the NASDA (Japanese National Space Development Agency) situation. Research, electronic development, and specialized agencies of five government ministries are interlocked, with oversight by a Space Activities Commission. Satellite launchings, with help from our NASA in some cases (tracking, for instance) are done from the island of Tanegashima, off the southern tip of Kyushu. There are major tracking stations up near Tokyo (Katsuura) and on Okinawa, and two down-range toward Kwajalein. There is also a major Tokyo University space center on southern Kyushu.

Two satellites have been dispatched; three more, including meteorological and communications versions, are to go up in 1977. The tracking and control center (Tsukuba, near Tokyo) has Hewlett-Packard, duplex Fujitsu FACOM 230-38 and duplex 230-75 equipment; the meteorological data processing center has two multiprocessor 230-75 installations. Hence, Fujitsu's pride in the project! And needless to say, there was heavy software involvement: on-line stuff, tracking and command, image processing. New work includes integration of the systems at the above two centers, celestial mechanics and telemetry subsystems, and so on.

I was told this story, and about the banking net, in Tokyo and Kawasaki. I then got a fascinating tour through the LSI research operation – or, more likely, a small part of it. This included the first look I have personally had at experimental equipment for ultramicrolithography, and this was in advance of the Japanese national VLSI project support, which involves cooperation with Hitachi and Mitsubishi, and other support from the telephone company. I was not asked to sign a confidentiality promise, as is sometimes done in the U.S., but I was asked not to talk too freely about what I had seen. My guess is that with the exception of IBM and possibly TI, this Japanese venture is as advanced as anything here, and – if one includes the reduction to high-yield practice – ahead of anything in Europe.

My hosts then whisked me off to a resort hotel near Nagano, presumably to test my resistance to a Japanese breakfast. Reminded me of some curious morning repasts in Jerusalem, it did, only no herring! Well, like the WW II veteran asked what he did in the great conflict, I survived! Compared to the raw tuna, cuttlefish, sea urchins and ginger slices of a magnificent Tokyo *sushi* feast, it was minor stuff.

My major impression at the huge factory was of the fantastic investment in automated test procedures, most of which required special machines designed and built inside Fujitsu, and incorporating their own small computers and numerical control equipment. Another was of the diligence of the workers, male and female alike; a great asset to their society, as we all know, although somewhat reduced in the eyes of easy-hire-easy-fire California by the necessity for career-long security from the employer. As I said in a speech some years ago in Geneva, Japan is a very IBM-like country!

Due to the rapidity of systems test, and to the fact that LSI components contain much more of the complexity of the total machine than 360 modules or second-generation boards (and are completed tested elsewhere), the 230-series machines march down the automated line and out the door at a fine rate. A great deal of attention is paid to failure analysis, both by examination of voluminious computer outputs from the test gear and from the system being tested, and by physical checking of hardware before it is recycled.

After a great steak luncheon at the luxurious Sacramento (!!) restaurant, I had a shorter tour of a sister plant which makes components, including those for ultra-long-life submarine cable repeaters. Then there was a remarkable train ride, over three hours, through the mountains of central Honshu, north to Nagoya.

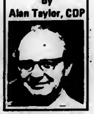
The user conference was held at the Nagoya Castle Hotel, more modern even than the Imperial in Tokyo where I stayed this trip. A little less English spoken, perhaps, than on the Tokyo/tourist circuit, but beautiful European cuisine. I tried a Japanese white wine, but would next time join my companion in a Pouilly-Fuisse! Anyhow, I was tucked in for the night, with floodlit Nagoya Castle framed in my picture window.

I gave the keynote next morning, on industry futures and new technologies. Speakers get to wear white silk chrysanthemums, with red ribbons saying (I presume) "honored guest." Much prettier than our dull badges. And I used up forty business cards that day alone! As I said in the previous column, I had 800 registrants and perhaps 50 Fujitsu people in my audience; simultaneous translation – for that session only, so I could not hear the technical papers. But, as the seminar I did the year before with other *Computerworld* people, there were good questions from the floor; this is still not too common in Japan, and is one thing American speakers are encouraging. And, as I also said before, there are now women in the audience.

Herb Grosch

Feedback to Management Marks Second Generation

The Taylor Report
By
Alan Taylor, CDP



The Supreme Court has spoken, and the systems analysts of the airline industry now know that it is – and always was – wrong to issue more confirmed bookings than there are seats on a plane, even when a government agency is prepared to look the other way. And now the search is on for replacement algorithms to supplant the old percentage overbooking ideas.

In many ways the airline analysts are lucky. They don't have to convince their boards of directors and presidents that something has to be done. The court has done that for them.

The analysts don't even have to convince anyone that whatever solution they now put forward will have some problems. The long-standing defense of the current overbooking standards has included objections to pretty well every possible alternative, so these are still fresh in most persons' minds.

But the systems analysts do have to do some work themselves. They have to think about just what role of a systems analyst is and just what system selection is now going to be. And no one is really laying this out for them. So here goes.

Looking back, we can now see that in the first-generation systems the role of analysts was to:

- Take some particular solution.
- Compare the amount of work it needed with the amount of work other possible solutions needed.
- Select the one with the least amount of computation.
- Tell management the "correct" solution had been found.

In this matter, it was assumed there was a simple, correct solution.

And that was the hallmark of first-generation systems. In fact, many of the suggested solutions were the best immediately available ones, but they were not complete solutions, just approximations.

Second-Generation Systems

In second-generation systems this point, that the simple solution is just an approximation, is recognized. The analyst's question now becomes how to handle "failures" that result from the use of the approximation. Obviously, systems analysis being something that deals in quantitative as well as qualitative matters, this is an area where the analysts can perform some good work. The analyst will document, as a part of the operation, the results of the approximation under study.

From management's point of view, this part of the analysis will not be happy reading.

All sorts of things will be discussed here which have been quietly kept under the rug during the era of first-generation systems.

The airlines now know what the results can be in their own case. They can lose a nationally publicized lawsuit and have their overbooking practices brought to the attention of the buying public. Taken to extremes, it could look as though every overbooked, bumped passenger would now sue and that the suits would be as expensive to defend and lose as the Nader one has been.

This analysis of results is unrealistic, however. In fact the cost of continuing to overbook would be imparted by management decisions as to legal strategy, whether to admit liability, etc. There is no way in which a systems analyst can forecast such necessary management decisions, which brings us to the second point of second-generation systems.

No 'Correct' Alternatives

In second-generation systems, the systems analyst no longer decides the "correct" alternative. Knowing there is no correct alternative, he places the decision before management. True, in case of need, he may say that until he is overruled such and such a decision will be assumed.

Even here, however, he admits management not only has a right to overrule his opinion, but, because it knows better than he can how management decisions will affect problems that will inevitably arise, management actually does know best.

The second-generation systems analyst, knowing what system is to be used and knowing the problems involved, has now to face the question of how to organize a solution that will minimize the problems.

In the first generation of computerized systems this was an ignored part of the operation. The solution, once programmed, was effectively set into concrete, which gave rise to the well-known "computer arrogance" syndrome.

The appearance of arrogance is still with us in too many cases simply because the system was not designed to be flexible.

Minimizing effects is possible only when one knows what effects are occurring. The key to the new systems approach must therefore be to provide such knowledge.

Now we come to a staffing problem. Under first-generation systems philosophy, the system was designed and implemented. Then the analysts went away.

Problems were allowed to develop over the years without the attention of more than a maintenance programmer who wasn't a systems analyst. Sometimes, of course, the programmer did change the system to meet one systems problem, but not being trained in the nuances of the matter, might – and did – wreck other parts of the systems while being successful on the surface.

This inadequate staffing just won't be possible for second-generation systems. The trained understanding of the system must continue throughout the operation of the application somehow or other.

Some form of feedback regarding the incidence of the problems that do occur and the effectiveness of minimizing methods in use will be needed. "No problems reported" will be a familiar report. But in second-generation systems that report in itself, given in full knowledge of what the potential problems are, is the mark of a good system collaboration between analyst, management and operations.

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Reader Commentary

The ACM Presidential Election: Another View

By Jean E. Sammet

Special to Computerworld

It is with considerable regret that I feel I must end my term as president of the Association for Computing Machinery (ACM) by responding to Herb Grosch's May 31 column and, indirectly, to some of his other columns.

I have not responded in the past because I decided silence was in the best interests of ACM. However, I now feel it is essential to set the public record straight.

It is regrettable the incoming ACM president has chosen to repeat many of his false or meaningless charges in a public newspaper. Furthermore, he has a remarkable knack for masquerading virtues as vices and vices as virtues.

For example, he appears to criticize me for working hard and simultaneously says *he* doesn't believe in working hard. (You may decide for yourselves wherein lies the virtue or the vice.) Similarly, he constantly refers to some nonexistent and undefined "Establishment" in a pejorative manner but fails to mention any of the reasons for the opposition to him from many people who have worked closely with him.

Let me state my views and some facts:

1. I consider it the duty and the responsibility of any nominating committee to select the best qualified people available. Since the incumbent vice-president has an obvious advantage, it seems clear the nominating committee decided Grosch did not meet that criteria.

The reasons it had in selecting the nominees for vice-president can best be addressed by the nominating committee, but I can guess the nominees were simply people with greater experience in, and service to, ACM than other potential candidates.

To point out that people supported nominations by petition does not mean much. I believe anybody of any prominence (which is not necessarily the same as experience or capability) can easily obtain the less than 250 signatures needed to run for ACM office.

2. Grosch proclaims his great activity in ACM. However, I regret to say I am unaware of anything constructive or significant he has done in any of the committees or positions in which he has served.

I feel his forte – and it is a useful one on occasion – is as a negativist, that is to oppose things other people propose. But from my experience I am unaware of any significant action ever initiated and carried through by Herb Grosch before or during his service as vice-president.

Even in areas and on policy issues where he and I were in significant agreement, and where some work on his part would have been useful as far as I am concerned, he did not volunteer (and/or decline) to do anything.

3. Grosch seemed to imply in his column that one of the reasons he ran for ACM president was for spite. He stated he "would probably have refused nomination" as president if he had been offered a chance to run as member-at-large; he certainly could have obtained petitions for that position!

The reader should form his own opinion on the quality of a person who runs for office if one of the reasons for doing so is apparently in order to thwart others.

4. Grosch continues to refer to "the Establishment" as some vague but bad group. However, as a Council member since 1968 and as a vice-president since 1974, Grosch has to be classified as a member of the Establishment *using the most common meaning of that term.*

Although Grosch never defines "Establishment," I think he really means anybody who disagrees with him!

5. Grosch implied Tony Ralston was involved in the effort of sending letters to various individuals supporting Carl Hammer. Tony had nothing to do with this effort and, in fact, he advised against it.

6. I remained silent when Grosch used his April 12 column to write a long diatribe against me (albeit without naming me) and to misrepresent my views; I regard this as the use of his column to espouse his own viewpoint on the matter of ACM as an educational and scientific society while he was a candidate in the ACM election.

I feel he implied this was a significant campaign issue. However, as I read his platform statement he devoted approximately 35 words (out of a total of about 500) to this issue, whereas he used almost 70 words in his platform statement to criticize Tony Ralston and me (and misrepresented my views and actions while doing so).

I think it is unfair for him to claim this was a major campaign issue when *he* devoted so little space to it!

My March "President's Letter" in the *Communications of the ACM* was a clear-cut statement of *my own view* on why ACM should remain an educational and scientific society. As far as I am concerned, this was *not* a significant campaign issue; a number of the people who opposed Grosch agree with him on this point and didn't like my March "President's Letter" either!

It was a coincidence it appeared at that time, but it had to appear in the March issue because I wanted to state my position on this matter before my term ended and the letters for April, May and June were committed to other topics where specific timing was required.

7. I do not agree with Grosch when he implies he had not used his column for "personal ACM advantage" prior to the column [CW, April 12] that he seems to admit was used in that context. He has certainly used it for ACM matters, although I do acknowledge he has quite properly *not* made use of internal ACM correspondence.

However, he *has* used it to espouse viewpoints on ACM matters, knowing full well he might be a candidate in an election and thus might have an advantage relative to other candidates.

In one column he castigated the ACM Council for actions he didn't like. In another and more serious pair of columns, he castigated the IEEE Computer Society and criticized a number of individuals for actions they took which he felt were deleterious to ACM.

I found his comments about the others so insulting I twice felt obliged to send letters to the individuals involved indicating that his was not an official ACM position.

8. I do not understand what the "dour grip of the Establishment" is. Many of us have worked very hard for ACM and have disagreed on many issues. I have found no evidence that Grosch has done any significant work for ACM in the past, and to me his column implies he's not likely to do very much in the future.

Nevertheless, I accept the decision of the ACM membership and I am quite prepared to cooperate with President Grosch if he wants such cooperation.

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Process With 11 Steps Suggested

Total Study Urged for Users Considering Packages

By Don Leavitt
Of the CW Staff

NEW YORK – The decision to adopt or avoid packaged software is more critical than is generally recognized; no matter how the decision goes, it will have ripple effects on the productivity in both end-user and DP areas within an organization, a session on "Productivity Payback" was told at the recent National Computer Conference here.

An economic analysis in conjunction with a feasibility study should ensure any proposed software purchase will have little if any negative effect, Thomas F. Meurer of Cullinane Corp. said.

On the other hand, he added, the usefulness of such an approach is largely dependent on the "active leadership and ongoing involvement" of user department managers.

Outlining an 11-step process, Meurer said it should provide answers on both the technical and economic feasibility of any acquisition or in-house development. But the results of each step must be the product of both functional (end-user) management and the DP staff, he emphasized.

Before going into the details of his plan – "and it's an expensive one," he admitted, "I don't know anyone who has implemented it completely" – he warned "quantitative techniques must be placed in perspective. . .analysis should be structured in a way which emphasizes the qualitative thinking and logical reasoning used to examine the key aspects of a proposal."

After identifying the problems "or opportunities" – "and that has to be an iterative process since later work may invalidate first assumptions" – the analyst has to describe the relevant environment, Meurer said.

This analyst has to describe the relevant environment, Meurer said.

This applies whether the proposed acquisition is a system/utility that affects the DP department or an application package, he added.

Objectives for Quantification

The next step is to postulate and quantify objectives. This will indicate how far the proposed system goes in meeting the identified needs, the speaker went on.

Without objectives, he noted, the payback gained from any decision "can't possibly be quantified.

"Since quantification is desired at this point, the objectives must be expressed in measurable terms," he reminded his listeners.

The final step in the preparatory part of Meurer's plan is to identify the assumptions and constraints that underly the objectives. Assumptions focus on the key factors, processes and variables affecting the analysis; constraints are factors external to the revelevant environment which also limit alternatives to problem solutions, he explained.

This step must be realistic, he warned, noting that any alternatives developed later can be considered feasible only if they satisfy all the restrictions assumed by the analyst.

If real restrictions are unrecognized, alternatives that seem to fit "just won't," while all possible alternatives may be washed out before the final decision if too many demands are imposed.

Stick With Baseline

Presumably the analyst is now in a position to develop alternatives, and a continuation of the current operation – as portrayed in the earlier environment description – probably should be considered. It is the baseline to which all other alternatives will be compared, Meurer explained.

The other choices "obviously" are in-house development of a new system, acquisition of one from "outside" or some sort of combination, he said.

However extensive the list, the next step is to determine costs involved with each choice, followed by cataloging the benefits each approach might bring to the installation or the end users within the

(Continued on Page 16)

Hardware Vendors Bring Most Software to NCC

By a CW Staff Writer

NEW YORK – Hardware vendors had more new software to talk about at this year's National Computer Conference (NCC) than all the software and service vendors.

But perhaps that's not surprising; after all, there were very few software vendors at the recent show, and it's hard to demonstrate software without some kind of equipment.

Four-Phase Systems, Inc. demonstrated its Starter package, designed to help novice users set up CRT screens and work their data entry systems. At the same time, Datapoint Corp. announced its DS3Net extension of Datashare, enabling users to access both local and remote data bases.

Hewlett-Packard Co. (HP) described its latest version of the Image data base management system. Image 1000 is meant for 21MX series minis and RTE-II and RTE-III operating systems, much as Image/3000 is meant for HP's 3000 equipment.

Control Data Corp. included its Cybernet remote-computing network as part of its display and vendor technicians were using Unistruc, a preprocessor for structural engineers, as the demonstration vehicle.

Now being test-marketed on the West Coast, Unistruc is expected to be generally available on the network in the fourth quarter.

Meanwhile, Systems Dimensions Ltd. described its recently implemented Project 2, a project management and control program that can be used for DP or more conventional projects.

Installation of Comten "smart" multiplexers has extended the Canadian-based network's capabilities to more locations on a local phone-call basis, a spokesman noted.

English Vendors

The largest collection of software new to the U.S. seemed to be available from the various English vendors at the show. Genesys Ltd., for example, had an integrated general engineering library including a Fortran-like language called Gentran and 20 operational application subsystems.

The software can be run on a range of U.S.-made minis and mainframes as well as International Computers Ltd. (ICL) equipment, he added.

Northern Software Consultants Ltd. showed details of its integrated series of accounting packages and noted it now has a U.S. agent – Software Design Associates here in New York.

Routines on Net

The Falcon Computer Bureau Ltd. had its professional service time-accounting routines implemented on the General Electric network and available for any user who felt capable of utilizing it on his own. A U.S. agent is being sought to provide support, a spokesman said.

On a more specialized note, Batelle Columbus Laboratories representatives said its Basis software had been adapted to Digital Equipment Corp. Decsystem-10, IBM 360/370 and Xerox Corp. Sigma 9 operation to support on-line retrieval of data base material.

People-Oriented Vendors at Show Outnumber Software Exhibitors

NEW YORK – Vendors with training and other people-oriented products were more in evidence at the recent National Computer Conference (NCC) than software and remote computing vendors, but even the educational exhibits were nearly overwhelmed by all the hardware being show at the Coliseum.

Advanced Systems, Inc. (ASI) of Elk Grove Village, Ill., used its booth to demonstrate its latest multimedia courses – video cassettes and student workbooks – designed to sharpen trainees' understanding of the IBM 360/370 environment and current concepts of program design and development.

Deltak, Inc. was also on the floor, featuring its multimedia courses on structured design, IBM's Information Management System (IMS) and the Time Sharing Option (TSO) of OS and OS/VS.

A 12-course program on "Practical Management by Objective" has been produced and is scheduled for shipment next month, a spokesman for the Schiller Park, Ill., firm said.

Touching on basically the same area, the catalog of books available from Science Research Associates of Chicago included *Management: Concepts and Situations* by Howard M. Carlisle; a new edition of the *Supervisor's Survival Kit*, "a mid-management primer by Elwood N. Chapman: and *Systems Analysis* by Philip C. Semprevivo.

Each of these has an instructor's guide to aid in adapting it to a classroom situation, the publisher noted.

There were in fact many publishers of a variety of books and periodical at the show. Trade magazines and newspapers were much in evidence, but so were both Auerbach Publishers, Inc. and Datapro Research Corp. with their various reference guides.

Boeing Computer Services, Inc. of Dover, N.J., best known in its role as a remote-computing network vendor, talked about Scope, an evaluation test approach for IBM 360/370-oriented programmers and operators.

At the same time, at least two rather local firms – Software Education Corp. of New York and Chubb Institute of Short Hills, N.J. – also had booths at the show and described their capabilities in support of training classes either at a central location or at a customer's site.

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Self-Assessment Form Offered

Unionism Seen as Growing Challenge for DP Manager

By Jack L. Stone
And Alexander P. Grant
Special to Computerworld

Unionism among DP personnel is growing. All categories of DP employees are becoming involved, including professional, technical and administrative personnel.

Although we estimate the number of computer centers currently unionized is still small, many indicators suggest the trend is rapidly increasing. Specifically, interest in unionsim is intensifying and broadening among DP programmer/analysts.

DP managers and supervisors who wish to assess their effectiveness in managing DP personnel can obtain the questionnaire for no charge by writing Stone at Suite 222, 2233 Wisconsin Ave. N.W., Washington, D.C, 20007.

In examining the reasons why programer/analysts are considering unions and the potential impact their unionism may have on the DP department, it is our objective simply to make management aware of this new challenge. It is not our intent to take a position either for or against unions.

However, as consultants in management development and training for DP organizations, we are concerned with the capability of most DP managers to deal effectively with unionized professionals. As one means of evaluating this capsbility, we have developed a questionnaire for management self-assessment. We will be please to send a free copy of this evaluation instrument to interested DP managers and supervisors.

Expectations Being Met?

Let's review some basic ideas of what DP professionals expect to receive from management in terms of their career aspirations and how well these expectations are being met. We define professionals as salaried scientific/technical employees exempt from requirements for overtime pay.

Dennis Chamot, in the May-June 1976 issue of *Harvard Business Review*, said that the professional employee and the employer are in basic conflict regarding the only practical means of resolving these issues.

"Unlike a production worker or a secretary, the professional expects to help determine the problems he will work on and the approaches toward their solution. All too often, his expectations fall short of reality.

"Dissatisfaction may result from inadequate technical support, insufficient opportunity to pursue interesting ideas, excessive interference by superiors, lack of sufficient input to project assignment decisions and so on," Chamot wrote.

This statement well characterizes the view of many of our programmer/analyst friends and students. In many DP departments, crucial decisions regarding their fundamental capabilities to operate effectively and efficiently are being made by managers who often do not have the necessary DP expertise and knowledge.

Upon these managers' authority, new applications are forced into the already overcrowded development program, with the usual requirements to meet impossible deadlines with no increase in manpower.

The outcome is predictable: poor design, project delays, inefficient systems and inadequate support. Many programmer/analysts feel coerced into taking such assignments, since the alternative could be loss of job.

Resentment of Management

Management often is not sensitive enough to the effects this situation has on the individual, particularly when these conditions persist over long periods of time. The programmer/analyst perceives his role to be absolutely essential to the DP operation.

He usually believes that a great job has been consistently performed in spite of management inadequecies and that management has taken advantage of the professional staff by virtue of its authority.

Many programmer/analysts feel, but do not necessarily openly say, management is making uninformed and arbitrary decisions which are denying them fundamental job rights, including:

- The opportunity to execute their assigned tasks at a high level of excellence.
- Participation in systems development planning to ensure adequate time, manpower and machine resources are provided.
- Participation in systems performance evaluations to ensure judgments are based on quantitative data and are fair and impartial.

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- Realistic and effective procedures for handling staff complaints and suggestions about the job and the organization.
- The opportunity to participate with management in the development and implementation of meaningful career planning.
- The opportunity to exercise a reasonable degree of control over personal career destiny.
- Controls over and/or additional compensation for continuing and excessive overtime work.

Movement Not Widespread

The logical question arises: If DP professionals have been thinking about unionizing, then why hasn't the movement become more widespread? Dennis Chamot addressed this issue in the previously cited article when he wrote:

"A major reason is that unorganized professionals frequently have limited knowledge of what unions ara and what they can do. They tend to think of unions in terms of not too accurate blue-collar stereotypes . . . They are unaware of the flexibility of collective bargaining

(Continued on Page 16)

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Studies Economic, Technical Feasibility

Process With 11 Steps Urged for Package Evaluation

(Continued from Page 13)

organization.

That sets the stage for the comparison of the proposed alternatives, Meurer said. The basic approach should be to order them from the least to the most costly and to show the extent to which extra benefits are associated with each added increment in cost.

Baseline a Must

The baseline – current – operation must be included in this array, Meurer noted, so the decision maker has good perspective on the problem. But another part of that perspective is provided by the next step in the process.

In that step, the analyst tests the alternatives for sensitivity to change in any of the assumptions or constraints previously defined.

This may be the most critical part of the whole study, Meurer stated, since it recognizes everything up to this point may be built on false premises and proposed solutions may not hold up in the real world after all.

Presentation of the analysis to the decision maker should entail preparation of a synopsis or abstract which highlights the data considered essential to an understanding of the study.

Visual Aids

Graphs, tables or curves might be particularly appropriate in this step of the presentation, Meurer said.

The final step – "but one that many installations skip over" – is an updating of the analysis as new information comes to light, especially if the discovery occurs before the final decision is made and the new information is critical.

"It's far better to keep on top of a situation than to wish later you'd followed a rumor which later put one of your proposed alternativea in a totally different light," he concluded.

Managers Facing Rising Unionism

(Continued from Page 15)

and the legal safeguards that exist for protecting their right to influence internal union policies. In short, they need realistic models for professional unions."

Among the possible advantages of professional unions in the DP department is the fact that unionism inherently requires management to reshape attitudes and direct substantial resouces to problems of employee relations.

In addition, personnel management policies and programs, if erratically or arbitrarily handled in the past, quickly become orderly, planned and controlled.

Further, professional personnel gain confidence in dealing with management on issues. Feelings of professional stature are, in some measure, restored. This newly gained confidence should result in increased levels of productivity, but we have no proof that this is the case.

Possible Disadvantages

The potential disadvantages of professional unions include the possibility that unions may seek to negotiate a much broader range of issues regarding personnel relations than management would prefer.

As management is required by law to bargain in good faith, it is obvious management stands to lose some of its historic power and control over the DP professional staff.

Another possible disadvantage is that day-by-day management flexibility to assign tasks, hours and workload, which employees often call "exploitation" and management often calls "necessity," may be greatly reduced.

In addition, salary and fringe benefit schedules are fixed, uniform and competitive; unscheduled bonuses, cash awards and special benefits are often prohibited.

Further, tightly controlled grievance procedures will be installed, probably necessitating a major overhaul in personnel policies and practices.

Stone is the managing editor and Grant a senior associate of Computer Education International, Inc. of Washington, D.C.

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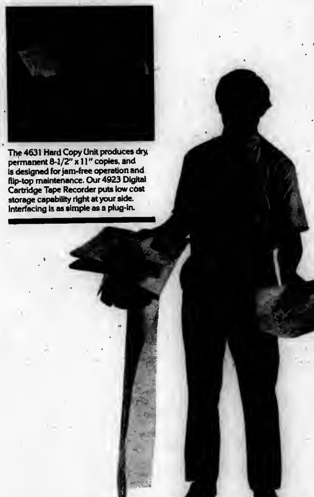

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Critical Need for Greater Software Productivity Cited

By Molly Upton
Of the CW Staff

NEW YORK – There is an urgent need for improvement in software productivity, panelists agreed at a session on "Software Engineering – What to Expect in the Next Decade" at the recent National Computer Conference here.

But they clashed on the rate of progress currently occurring and the means by which software engineers can be more productive.

Jack Goldberg of Stanford Research Institute presented a case for the integration of software and hardware engineering.

"The programming community has struggled hard to gain control of software, but has been ignoring the hardware world," he said.

Software people should "look over their shoulders" at the progress being made in hardware. New developments in low-cost componentry, such as microprocessors, are leading designers to use these instead of software, he said.

Harlan Mills of IBM in Gaithersburg, Md., said little will happen in software engineering in the next decade, but explained he didn't mean to be pessimistic as much as he meant to emphasize how short a decade is.

A significant event, he said, will be the rediscovery of classical tools that have been written off by today's systems engineers, such as formal grammar and recursive functions.

In addition, there should be an educational awakening because the universities have just barely realized what the good things are to teach, he said.

Robert Balzer of the University of Southern California at Marina del Rey said he's an optimist and thinks quite a bit will happen in 10 years.

"Structured programming is the greatest thing so far. Unfortunately, it doesn't solve programming problems, but it is the basis for vast strides forward," he said.

Balzer feels machines should be used to automate more of the programming. Causes of current software problems include lack of technology for specification, implementation, modification and optimization of programs, he said.

Optimization at many levels obscures clarity, Balzer said, proposing instead that a better way of programming is to design specifications to a formal abstract program, test that and then optimize it. He called this process "transformational implementation."

Eventually, he said, there could be a machine catalog from which the systems engineer could select a program whose validity is assured so the programmer need only be concerned with implementing and optimizing the program.

'Seven-Year' Rule

Tom Steele Jr. of Equitable Life classified himself as a pessimist, citing his "seven-year rule": "It seems to take seven years from the gleam in the eye of a laboratory technician to a first commercially available system."

The items in the lab today will be the mainstay of 1995, he added.

But what is alarming, he said, are statistics from the book *Data Processing in 1980-1985*, published by Wiley Interscience, which indicate that, by the 1980s, 70% of the work force will be dependent on DP to do their jobs and that more than 25% will have to have some knowledge of how computers work.

The demand for DP will vastly exceed the supply if software development is similar to the current state, he said.

Also within the 1980-85 timeframe, the cost of a system will be 90% to 95% the software cost, he said.

As an indication of the slow rate of progress in software, every decade raw hardware performance grows at a factor of 100, while cost/performance increases by a factor of 50.

However, the best crude estimate of increases in software productivity is 3% per year, he said, so in 10 years there will be a 36% improvement.

Extrapolating, he said 7.5 million programmers will be needed by 1985 if software continues at the current rate of improvement; four million will be needed if it improves at a 10% rate.

"We need real breakthroughs," he said, comparing the progress in software engineering described by other panelists as a "pimple on an elephant."

Runtime Problem

Maurice Wilkes of England's University of Cambridge said programmers must look beyond structured programming. The real problem is they have no idea of the runtime their programs need, he claimed.

It is tempting to use primitives in a "highly elegant and satisfying way" with disregard for the consequences in runtime, he said.

Patricia Goldberg of IBM's research center in Yorktown Heights, N.Y., said she sees improvement of compiler generation by 1980.

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Error-Detection Approaches Suggested

'Corrupt' Data Called Major Culprit of Data Bases

By Catherine Arnst
Of the CW Staff

NEW YORK – Incorrect data is one of the "serious impediments to the effective use of computerized data bases. Any decision-making system is only as good as the data which it uses; this is especially true of computer-based information systems."

This "truism" was elaborated on by Michael Hammer of the MIT Laboratory for Computer Science at the recent National Computer Conference here.

The major error problem with a data base lies with data that "is already corrupted" before it is input.

Naming several types of errors that can occur in a data base, Hammer said there can be the wrong data type (such as a word rather than a number), an inconsistency between fields of one record and fields of related records, some pattern out of order in the data base as a whole and missing data.

"Bad data can cause the malfunction of application programs that use the data base and can even degrade the performance of the data management software itself.

"On a more systematic level, erroneous data can destroy the confidence of an organization's personnel in the entire information system," he said.

Significance Unequal

However, not all data errors are of equal significance in the context of a particular information system. "It would be appropriate then, for a data-checking system to expend its resources in proportion to the importance and severity of the errors it is trying to detect," Hammer said.

The state of the art in error detection in relatively undeveloped, relying on "the simplest validity checks," Hammer claimed.

In addition, current data-checking systems are often very expensive to build and cumbersome, "relying on primitive brute force techniques to do the data checking," he said.

Conventional error-correction systems also do not provide a systematic capacity for response to an error situation, he said.

"Once the error has been detected, it is necessary to localize it and specify which data value is at fault. In many cases, the state of the art is incapable of doing this satisfactorily," he added.

Hammer proposed four general approaches that should be adopted when designing error-detection systems.

First, errors should be expected. "Do not design the kernel of the information system under the hypothesis that all data is correct and then delegate to an error-checking subsystem the responsibility of bringing about that state of affairs," he warned.

The goal of perfectly correct data is unattainable; the best that can be done is to minimize the presence of certain errors, he said.

Rules First

The second approach is to formulate the rules of the application first and then relate them to the constructs of the data base.

"Identify potential logical errors in terms of the data base transactions," he said.

Third, the importance of the various error types should be evaluated with respect to the decision process, considering both the sensitivity of the data and the impact of the error, he said. The resources of the data checking system should be allocated in line with this evaluation.

Finally, "anticipate the kinds of errors that may occur, identifying their sources, estimating their relative frequencies and determining the costs of detecting them."

The DP center should be prepared, he added, to adapt to changes in any of these factors: the definition of what constitutes an error, the patterns of actual error occurrence, the relative importance of errors and the costs of error detection.

"Learn from historical situations and detect emerging patterns as well," he said.

Cincom 'Total' DBMS Gets Data Dictionary

CINCINNATI – The Cincom Data Dictionary, recently introduced by Cincom Systems, Inc., provides documentation that shows IBM 360/370-oriented users of the Total data base management system (DBMS) what data they have in their systems, the vendor said.

While the first release of the dictionary was designed to interface specifically with Total, the second release – "probably in a few months" – will be a stand-alone version, Cincom said.

In that event, it presumably will be useful in any DBMS situation, the company acknowledged.

It will also interface, through a common file, with Socrates, Cincom's generalized extract and reporting system, the vendor noted.

Listings produced by the dictionary package typically are used by people involved in an organization's DBMS operation. The end user can be shown what data is already available at a level specific to his particular application interest.

At the other end of the spectrum, the data base administrator can have an overall picture of data, its structure and characteristics, relationships between data units and information about the physical placement of the data on storage devices, Cincom said.

The dictionary package was developed in-house which means, according to one spokesman, that it should be more efficient in its linkage to Total than a package written without detailed knowledge of the internals of Cincom's DBMS.

Available now for any IBM-based version of Total, the dictionary costs $275/mo or $11,000. Total itself – without the dictionary – starts at $825/mo depending on the version and options selected.

Cincom is at 2300 Montana Ave., Cincinnati, Ohio 45211.

How a $6 billion giant cuts audit problems to size.

By Karl Kalli, EDP Staff Auditor
Investors Diversified Services, Inc.
Minneapolis, Minnesota

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Bell Figures Seen Unsupported

By Ronald A. Frank
Of the CW Staff

NEW YORK – Despite claims by AT&T and other telephone companies, it is by no means certain that continued competition in telecommunications will cause residential phone rates to rise.

Bell has said residential rates will go up as much as 70% if the Consumer Communications Reform Act is not passed by Congress, but this figure has not yet been backed up, according to Andrew Margeson, staff member of the House Subcommittee on Communications.

Speaking at a session on data communications policy at the recent National Computer Conference (NCC), Margeson outlined the changes that would take place if the Reform Act were passed. "The Federal Communications Commission's (FCC) authority to permit connection of customer-owned terminal equipment would be eliminated.

"The specialized carriers would not be allowed to operate unless they could show the telephone companies weren't interested in their services – a virtual veto right with respect to competition," he said.

"I have serious reservations about such dramatic and extensive restrictions on competition, particularly in an area where the advantages of economic pluralism have so recently been demonstrated by new technologies and services offered by competing suppliers."

Recent FCC decisions which allow a number of suppliers to compete in developing new technologies have obvious benefits, and it would seem desirable to continue this policy, Margeson said.

Another panelist, Larry Darby of the Office of Telecommunications Policy, agreed there is lack of evidence supporting the Bell claims on higher rates. Darby said there has been a "lack of disinterested research." Also there has been "no outpouring of consumer interest" even though users will be affected by the outcome.

Margeson agreed on user disinterest and said the chairman of his committee has received only two letters from consumers.

Darby, who is an economist, said thus far the established carriers have not lost any sales because of the specialized carriers and the independent equipment suppliers. "They are only losing a piece of the growth," he said, noting that in the past the phone companies have captured 90% of the growth factor.

'Ready to Be Signed Off' by NBS

Encryption Standard for Nets Awaits Christening

By John P. Hebert
Of the CW Staff

NEW YORK – A data encryption standard solicited three years ago by IBM for computerized communication networks, is still being considered by the National Bureau of Standards (NBS), but is "ready to be signed off."

The christening of the NBS Data Encryption Standard is "essentially an administrative matter at this stage of the game," according to Dennis K. Branstad of NBS and chairman of a National Computer Conference (NCC) session on Security in Computer Networks here recently.

The encryption standard NBS is mulling over is a "64-bit block enciphering circuit and versatile LSI unit with high throughput capability that was designed for use in a wide variety of applications such as banking terminals, point-of-sale (POS) terminals and processors," Donald L. Heaton, one of the session's panelists, said.

The encryption chip "provides the network system designer with a powerful and cost-effective tool for solving many of the data security problems that currently face the (computer) industry, Heaton, who is with the Collins Radio Group of Rockwell International, said.

A copanelist with Heaton, Howard Wright of Collins Radio Group said the LSI chip would cost about $100.

The session hit on NBS proposed or implemented standards more than once as the other panelists – Harrison R. Burris of TRW Systems Corp. and Frank Heinrich of System Development Corp. – gave their respective talks on "Computer Network Cryptography Engineering" and "A Centralized Approach to Computer Network Security."

Encryption Methods

The three key methods of data encryption are a system of transportation, alphabetic substitution and arithmetic coding, Burris said.

In transposition, the computer data network user would permute the character arrangement in data transmitted from one site to another; alphabetic substitution, he said, involves the replacement of English language characters with symbols from other languages.

These methods, in and of themselves, are particular algorithms which are the "building blocks" of data encryption methods, but won't necessarily be sufficient precaution when used individually to ward off the sophisticated system "attacker," Burris said.

"The attacker knows the system," and in these cases the transposition algorithm,

(Continued on Page 23)

UDS Modem Entry Raises User Problems

By Ronald A. Frank
Of the CW Staff

Analysis

NEW YORK – The introduction of a full-duplex two-wire modem by Universal Data Systems (UDS) at the National Computer Conference (NCC) recently has raised some perplexing problems for communications users.

Until UDS came out with its 12.12 modem, the ability to operate over a two-wire circuit in full-duplex mode was limited to Vadic Corp., which pioneered its VA3400 late in 1972.

The unusual aspect of both the Vadic and UDS modems is that AT&T does not have a comparable data set. Most independent modem suppliers pattern their units after a similar Bell device with the stipulation that the modem is "Bell-compatible." In many cases this means the independent modem is a one-for-one replacement of the telephone company data set – usually with some added features and at a lower price.

The Bell data set often serves as an unofficial industry standard and most independent units pattern their transmission and interfacing features along these standards. But the Vadic unit was always an outcast, since it had no comparable data set after which to be patterned.

Now UDS has introduced its own version, which it admits is not compatible with the Vadic modem. The UDS 12.12 is described by the company as having some additional features at a lower price. It costs about $600 while the Vadic unit costs about $800, according to a UDS spokesman.

There are about 6,000 Vadic VA3400s installed, and soon there will undoubtedly be hundreds of the UDS modems also in operation. None of these units will be able to transmit data to modems made by the other supplier.

Vadic is reportedly studying whether the UDS data set has infringed on ideas patented in the VA3400. UDS spokesmen say the 12.12 was developed from the ground up. Users don't care much about patents, but they do like to have modems that are compatible with each other.

Meanwhile, AT&T is known to be developing its version of a 1,200 bit/sec data set that will operate over a two-wire facility. Up to now Bell has not introduced this unit, but some time ago it was reported the product had been shown to some prospective large users.

If AT&T decides to introduce its own model, will it be compatible with Vadic or UDS or will it set a third standard? As of now, an AT&T spokesman said there are "no plans" to introduce such a data set.

Meanwhile, users who are shopping for a 1,200 bit/sec data set will have to make some careful trade-offs if they want to operate in full-duplex mode over two wires.

Seminar to Address Reform Act

NEEDHAM HEIGHTS, Mass. – A national seminar on the impact of the Consumer Communications Reform Act will be held on June 29 in New York City by the Association of Data Communications Users (Adcu).

The session will also include an analysis of AT&T's proposed Multi-Schedule Private Line service by Dr. Dixon Doll, a communications consultant. It will include corporate impact of the MPL proposal and its relationship to specialized carrier offerings.

The Reform Act and what it means to users will be discussed by Herbert Marks, a Washington attorney and counsel for the Independent Data Communications Manufacturers Association.

Adcu is a recently formed organization of data communications users. The seminar will be at the Holiday Inn on 52nd St. in New York with free admission for Adcu members and a $20 charge for nonmembers. Details of the meeting are available from Robert Kaufman, vice-president at Damon Medical Services Group at 115 Fourth Ave., Needham Heights, Mass. 02194.

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Datapoint Printer Among Products Debuting at NCC

By Ronald A. Frank
And John P. Hebert
Of the CW Staff

NEW YORK – Data communications users visiting the National Computer Conference (NCC) here recently easily found product introductions.

In addition to the devices noted last week [CW, June 14], there were diverse offerings from other companies.

Datapoint Corp. unveiled the Model 9232 Freedom matrix printer which was designed, developed and manufactured by the company for dispersed business data processing.

The printer features an integrated bipolar microprocessor for forms handling and control of both the print head and tractor feed mechanisms.

The processor is said to maximize machine throughput by controlling bidirectional printing, accelerated "white space" spacing and accelerated line feed slewing at print rates equivalent to a maximum 350 char./sec, the spokesman said.

Each line of text is buffered before printing by the control program, which is contained in a permanently programmed read-only memory (ROM). The memory contents cannot be accidentally modified or erased by the user, the company said.

The Freedom printer has an 80 char./sec print speed for "normal text" in a 132-column, 5 by 7 dot matrix format at switch-selectable spacing of 6 or 8 line/in.

The printer reportedly is capable of speeds from 25- to 350 line/min depending on the application.

A 96-character upper- and lower-case Ascii font is supplied as standard equipment; international character sets are available on special order, Datapoint said.

An optional dual-tractor paper feed design allows handling different forms types, the spokesman added.

The Freedom printer carries a purchase price of $3,950 plus $100 for installation and $30/year for maintenance which also covers all repairs which may have to be made, the spokesman said.

The Model 9234 dual tractor option costs $500, plus a $10 installation fee and a $5/year maintenance charge.

Leases of 90 days and one, two or three years are also available, it added. Datapoint is located at 9725 Datapoint Drive, San Antonio, Texas 78284.

TEC Brings Model 1445.

TEC, Inc. in Tucson, Ariz., brought out its Model 1445 conversational-mode teletypewriter replacement.

The terminal operates at 15 switch-selectable transmission speeds from 50- to 9,600 bit/sec in serial asynchronous mode, the company said.

It displays 1,920 characters in an 80-character (5 by 7 dot matrix) by 24-column format on a nonglare 12-in. CRT screen; available interfaces include RS-232C, TTL or current loop for half- or full-duplex communications, TEC said.

Options for the Model 1445 include lower-case characters for display of the 128 Ascii character set; 40- by 24-character display and extended keyboard with Ansi 11-key numeric pad, it added. The terminal is priced at $1,495.

Xerox Terminal Bows

Xerox Corp. in El Segundo, Calif., introduced the 1700 interactive terminal which it described as a replacement for the earlier 3010 terminal. The microprocessor-driven unit operates at 10-, 15- and 30-char./sec using Ascii or APL characters.

The 1700 is available in a graphics mode for drawing charts and similar applications. The 1700 costs $2,981 or $130/mo on a one-year lease. A receive-only Model 1710 without keyboard is priced at $2,620 or $121/mo on a one-year lease.

Universal Data Systems in Huntsville, Ala., introduced a 1,200 bit/sec modem that can operate in full-duplex mode over a two-wire connection. Using "coherent phase shift keyed modulation" previously utilized in 2,400 bit/sec modems, the Model 12.12 includes both local and remote test features.

The 12.12 is said to use an interface discipline identical to the Bell 103 and 113 data sets. The modem can operate at full-duplex data rates of 150-, 300-, 600- and 1,200 bit/sec. It is priced at $600 or $20/mo on a 36-month lease.

Magnavox Display Systems in Fort Wayne, Ind., introduced the Orion-60 graphics terminal which includes a microcomputer and plasma display. A variety of firmware options described as "user-installable" are available, including incremental vector capability, APL character set and alternate control codes. The system costs $5,995.

Tab Products Co. in Palo Alto, Calif., brought out the Model 501C data entry microprocessor-based keypunch, which has all its capabilities stored in Prom, Tab said. The on-line terminal provides optional communication through an RS-232C interface at speeds from 110- to 9,600 bit/sec in either synchronous or asynchronous modes, providing data transfer capability between the unit and any CPU, peripheral subsystem or terminal, Tab said.

The basic 501C is priced at $6,850; the communications option is an additional $1,250.

Terminal Integrates RAM, Modem in Micro

HUDSON, Mass. – The MT-32 Merchant Terminal from Datatrol, Inc. was designed for use in retail transaction situations, including checking guarantee, check verification and credit authorization.

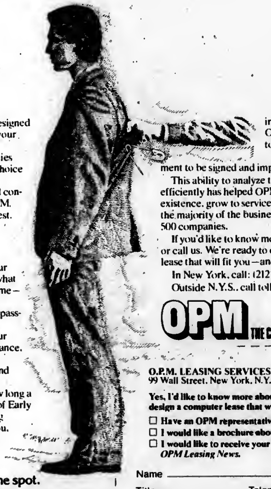
Random-access memory (RAM) is contained in the microprocessor, as is a modem. In outer appearance, the terminal is comprised of a 16-button keyboard, 12 message and prompting windows and an 8-digit numeric LED display, the company said.

Two optional devices available are a wipe-through magnetic stripe card reader and a personal identification number pad.

The MT-32 can be expanded to include a receipt printer to perform full electronic funds transfer system transactions, Datatrol added.

The terminal communicates asynchronously at 1,200 bit/sec but is capable of transmission speeds of 2,400- and 4,800 bit/sec, a spokesman said.

The cost of a basic MT-32 with integrated microprocessor and modem is $700, the spokesman said from Kane Industrial Drive, Hudson, Mass. 01749.



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Despite Present Limitations

Net Testing Seen Demanding Much Future Attention

By John P. Hebert
Of the CW Staff

NEW YORK – True end-to-end testing of communications networks has been very limited up to this point, according to Eric Wolfe of Bolt Beranek and Newman, inc., one of a group of people who spoke here recently at a National Computer Conference (NCC) session on "Network Measurements."

"Network testing techniques have not been the subject of a lot of research, but they will be something that will get a lot of attention in the future," he predicted.

"There is a need to do some research in network testing today.

Before building a network, question what testing facilities should be built into the system."

Part of this planning should include instrumentation – determined by asking how much and what kind of testing will have to be performed on a continuing basis, he noted.

For example, "how can you know if a front-end processor improves or hinders performance in a network?" he asked. The testing of a device such as this is "expensive to do, but it should be done because there is no literature available and it is a necessity," he said.

"Network testing is costly because you usually have to design the tests and interpret your own results. The only thing I know of that is more costly is to not do network testing," Wolfe said.

Other panelists in the session agreed with Wolfe on the point he made about built-in network testing functions.

"We will have to think in those terms in the future," according to Holger Opderbeck of Telenet Communications, Inc.

Another panelist, Don Allen of Bolt Beranek and Newman, Inc., said "when you look at the measurements of your network, you will be constantly surprised by what you see.

"Network testing facilities should be a part of the original design rather than an afterthought," he added.

A new resource-sharing technique which utilizes broadcast channels was discussed by one of the people working on its development for the Advanced Research Projects Agency (Arpa) at the University of California at Los Angeles (UCLA).

Fouad A. Tobagi said the system, called the Packet Radio system, is another example of a packet-switching network. It is now in the design phase, but will shortly be in the testing phase.

It is logical that Arpa is the system developer because the agency was first to utilize packet-switching techniques, having done so in 1969, Tobagi said.

The Packet Radio system has three functional components: terminals, packet radio stations and packet radio repeaters used as store-and-forward relays, he said.

A hierarchical routing algorithm is used to make the system look like the routing in a point-to-point network.

As was the case with experimentation with the development of the Arpanet in 1969, the Arpa Packet Radio system incorporates the ability to measure network behavior, he said.

Encryption Standard Awaits Christening

(Continued from Page 21)

for example, won't help much, he added.

But the combined methods of transposition and substitution as proposed by the NBS can significantly reduce the probability of a successful attack, he said.

Other encryption methods described by Burris included clock synchronization implementation to restrict data access (like a timed bank vault) and different keying methods, such as auto key systems.

These methods are necessary in computer networks where sensitive information is regularly transmitted, he indicated.

'Classic Problem'

Calling the restriction of information from unauthorized persons a "classic problem," Burris said encryption of some kind is needed for the protection of system performance and the restriction of the system's resources to authorized persons.

Frank Heinrich, on the other hand, suggested a centralized approach to computer network security to provide an environment that wouldn't be compromised.

The types of data security violations include unauthorized access, where a legitimate user has no authorization for a certain type of information contained in the network; forged user identity or penetration; counterfeit network resources such as bogus terminals and counterfeit host CPUs; network communication threats + line tapping, for example; and misrouting or misrouted messages – intentionally or otherwise.

Network Security Center

The network security center (NSC) protects these layers of network design if it was implemented at the network resource or terminal level, he said.

"The NSC should be a separate, secure facility which provides user identification authorization and authentication and which maintains network access control information," Heinrich said.

The NSC should verify the user's identification and require a password based upon secure, stored information. If access is approved, the user should receive cryptographic data communications, Heinrich said, stressing the importance of cryptographic techniques.

An NSC can be operated with a minicomputer, like the network he has worked with which had a data base accessed by about 1,000 active users with about 3,000 terminals.

In that particular data base, 750 byte/user was required of the NSC, with a secondary storage of .76M bytes, he said.

Heinrich lauded the proposed NBS encryption standard, saying it provides the computer network system with an encryption method which is not affected by throughput and allows the quick implementation of security techniques in a low-cost manner.

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Sweda Adds System for Hoteliers' Use

PINE BROOK, N.J. – Sweda International has an entry for the innkeeping industry with a minicomputer-based accounting, data collection and point-of-sale (POS) system.

The 800/80 Hospitality System incorporates what the company called a proven hotel/motel software system, the Sweda System 80 minicomputer, CRT and POS terminals, line printers and disk storage in a stand-alone, on-line environment.

System features were designed to facilitate reservations, registrations, guest ledger accounting, room status reporting, name search, automatic room selection, the preparation of welcoming letters for guests, reservation deposit letters, travel agency accounting and night audit operations, the company said.

Up to two years of reservations and information on up to 3,500 travel agents can be stored on-line in the system's 5M-byte, 16-sector rigid disk and can be called up by the 32K-byte core minicomputer, a spokesman said.

Accounts payable and receivable, general ledger, payroll and archive files are also available on-line through the system, he added.

Peripherals available with the system include basic Hazeltine 2000 CRT displays, a choice of line printers with speeds of 60- and 200 line/min and up to eight Sweda Series 800 POS terminals, the company said.

Operations at the front desk requiring entry through the CRT keyboard are in "conversational language," according to Sweda.

The price for a basic 800/80 system including software, the System 80 CPU, two CRTs, two Centronics line printers (models 306 and 101) and two Series 800 POS terminals is about $60,000, depending on user requirements, the spokesman said.

Delivery is in 90 days, he added from 34 Maple Ave., Pine Brook, N.J. 07058.

Terminal Transactions

DEC Micro-Based Text Editor Slated for Printers, Publishers

MAYNARD, Mass. – Digital Equipment Corp. has introduced a microcomputer-based, text-editing terminal for the printing and publishing industries.

The VT71/T desktop video display terminal was designed for use with computerized editing and typesetting systems and incorporates variable-speed pan scrolling and a large-character, glare-free display, DEC said.

The terminal contains DEC's LSI-11 programmable microcomputer which permits internal storage of up to 40K characters of copy.

The microcomputer comes with 12K- or 28K words of memory.

In addition to the standard typewriter keyboard, the VT71/T offers two color-coded 18-key keypads for text editing and copy dispatching as well as 16 memory keys at the top of the standard keyboard that enable the user to custom-design certain editing functions, the company said.

The terminal's 15-in. screen displays 19-point characters in a 10 by 10 dot matrix and in a 24-line by 80-character format, DEC said.

Editing features include a "search and replace" function and an UNDELETE command which is said to allow the operator to restore copy deleted by mistake.

The terminal is reportedly compatible with all other DEC editing terminals and typesetting systems. The VT71/T can be added to or replace existing configurations or can be mixed with DEC's VT61/T or VT20B editing terminals to create new systems, according to a company spokesman.

DEC VT71/T Editing Terminal

A basic VT71/T, including the LSI-11 microcomputer with 12K words of memory, costs $7,250. A full 28K memory unit costs $9,750, with first deliveries scheduled for the fourth quarter, DEC said from Maynard, Mass. 01754.

MDS Reconfigures, Cuts Price of 2300

PARISIPPANY, N.J. – Mohawk Data Sciences Corp. (MDS) is offering reduced prices on the Model 2300 minicomputer-based, bisynchronous communications IBM Hasp workstation terminal system.

The stand-alone terminal system includes the ability to choose seven terminal protocols from a menu format, a minicomputer with 4K bytes of core, a CRT display, 230 Kbytes of disk storage and a keyboard for direct data entry, which can be programmed for job setup, an MDS spokesman said.

The standard terminal system controller, an IBM 360/20 IBM Hasp multileaving workstation, configured for low-volume configurations with a Model 2453 400 card/min reader and a 30 char./sec bidirectional printer, is priced at $591/mo on a three-year lease, the company said.

The same system equipped with a 100 char./sec printer costs $676/mo for three years, it said.

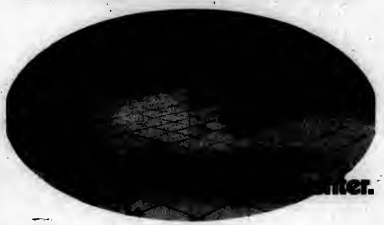
A third configuration includes the System 2300 Hasp terminal with the above equipment and the 300 line/min drum printer and is priced at $718/mo on a three-year lease. All prices include maintenance, the spokesman said.

The spokesman said the third configuration option had cost about $1,000/mo on a three-year lease before the price reductions.

Configured as a remote processing/transmittal workstation, the System 2300 with the 30 char./sec printer rents for $399/mo, maintenance included, over a three-year period. This basic configuration carries a purchase price of $10,400, the spokesman said.

MDS can be reached at 1599 Littleton Road, Parsippany, N.J. 07054.

Wang Data Center



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Bits & Pieces

Three Mass Memory Systems Purchased by OSI From PIC

SANTA CLARA, Calif. – Optimum Systems, Inc. (OSI) and Precision Instrument Co. (PIC) have reached an agreement under which OSI will purchase three PIC System 190 Laser mass memory storage units.

The systems, valued at $1.2 million, will be installed in OSI's data centers in California and Washington, D.C., in what is said to be the first commercial use of this technology outside the U.S. government.

The System 190 uses laser technology for recording and reading digital information. In their initial configurations, each System 190 will contain 16G bytes of on-line user data.

Pillows Act as Fire Retardants

CLIFTON, N.J. – Lensclean, Inc. is offering a fire-retardant, a malleable 12 in. by 12 in. cloth bag, which is said to be particularly suited to computer room operations with a floating floor.

In addition to serving as retardants to fire and smoke, the Fire Plug Pillows help check the flow of air conditioning emanating through the open areas in the floor.

Lensclean is at 31 Styertowne Road, Clifton, N.J. 07012.

Tape Rack Holds Seals, Canisters

The dual-purpose Compurac computer tape rack manufactured by Morton Industries, Inc. is designed to hold both canisters and seals in combination without any adjustment.

The rack comes in six models with capacities ranging from 40 seals or 24 canisters on a one-level rack to 240 seals or 144 canisters with the six-level model.

Delivery is from the firm at 33120 Arlesford Drive, Solon, Ohio 44139.

Qume Printers Based on MOS Micro

HAYWARD, Calif. – A family of single-chip MOS microprocessor-powered character printers has been announced by Qume Corp.

The Sprint Micro 3 series includes the Widetrack, which features a carriage twice the width of conventional printers and operates at speeds up to 40 char./sec, according to the firm.

Other members of the family include the Sprint Micro 3/35, 3/45 and 3/55, all of which use standard print wheels, and the Micro 3/X30 and 3/X40, which feature metallized print wheels.

Prices in OEM quantities of 100 range from $1,070 for the 3/35 to $1,700 for the Widetrack. Delivery is 30 days from the firm at 2323 Industrial Parkway West, Hayward, Calif. 94545.

Designed for College Research

System Aids Study of Multiprocessing

By Esther Surden
Of the CW Staff

NEW YORK – A multiprocessor system developed at the University of Rochester in Rochester, N.Y., was designed to investigate how operating systems can be designed in a multiprocessor environment and how the labor that must be performed is best divided between system software and processors, Neil Wilhelm of that university told an audience at the National Computer Conference (NCC) recently.

The multiprocessor system, designed as a research and investigative tool, had to have more than two processors. The system also had to be constructed so the user could change processors quickly. The multiprocessors also had to have a flexible I/O system and a large word size to simplify data transfer, he noted.

The university decided to use four processors that would communicate to the common memory via a memory bus and to special functional units via selector-type channels. Special low-speed devices would be connected by other low-speed channels, he said.

The researchers also tried to achieve a fast overall microinstruction rate. The independent processors were not to be aware of each other's existence, and the data paths were to be 64 bits wide.

In designing the system, the researchers used what Wilhelm called the Control Data Corp. approach. They used a cyclic barrel of registers rotated through a fixed set of hardware. The processors consisted of 64 registers each with 64 bits and shared all other resources. This resulted in less hardware, lower cost and fewer wires, Wilhelm noted.

Some of the features the team tried to achieve with the system included field extraction capability with each microinstruction, conditional branching with each microinstruction, modular automatic subroutine and return address stacking, indirect specification of registers, functions such as priority decode and microinstructions as closed instructions.

DEC Multiprocessor System

Another speaker, Robert M. Glorioso, outlined the method his team of researchers used when creating a modular multiprocessor system using Digital Equipment Corp. LSI-11 microcomputers.

The researchers, who received help from DEC, tried to keep the cost of the central control to about $1,000, he said. The operating system had to be incorporated on either hardware or firmware; processors had to be added without catastrophic results; the system had to appear as a mid-sized time-sharing system and provide quick response and access to facilities, he said.

Another feature of the system would be that if a user were bogged down he could plug in a few more processors to cope with the problem.

The network that was constructed had all processors connected to all other processors. Fundamental units were allocated to different kinds of tasks. One was assigned to program development and one to file management.

The interprocessor controller has a large bus that allows communications with all functional units and with a switch that polices communications between the units.

The system works as follows: When a user asks for a service, the service is allocated to one controller. The task goes into a ready state and the controller looks for a resource to accomplish the task. The controller then assigns a processor to do the task.

The task can be running, terminated, request a file or wait. If the task runs too long, it may reach a time-out state and be sent to a normal state until a functional unit is free, he noted.

There are some problems with deadlock on the system that have to be resolved, he said. A member of the audience pointed out that the system is extremely fault-sensitive because, if one node goes out, all high-speed devices could be out of order.

NCC Hosts Release of Products From Xerox, Ampex, Recortec

By E. Drake Lundell Jr.
Of the CW Staff

NEW YORK – In addition to the printers and data entry equipment announced at the recent National Computer Conference (NCC) [CW, June 14], several other products made their debut.

For example, Xerox Corp. in El Segundo, Calif., introduced a model of its 1200 nonimpact printer line that can operate either off-line or on-line to IBM 360s and 370s. The Model 2 operates off-line from tape, while in the on-line mode it emulates an IBM 3211 impact printer, the firm said.

The unit uses xerographic techniques and prints at 4,000 line/min with lease prices starting at $1,600/mo and a purchase price of $175,000.

Also Xerox added a 7-track tape input capability to the 1200, the firm said, making it compatible with 7-track tapes having BCD even parity and binary odd parity.

In other action, Ampex Corp. of Marina del Rey, Calif., introduced the ARM-2365E, which is an expanded version of the 1M-byte mainframe memory introduced in 1973. The unit allows up to 8M bytes of memory on a single port. A 1M-byte configuration is priced at $130,000, the firm said.

NSC Offers 256K-Byte Memory

SANTA CLARA, Calif. – A self-contained solid-state bulk data memory system that can store 128K words of 22 bits (256K bytes) and stands 5.25 in. high is available in quantity from National Semiconductor Corp. (NSC).

Known as the Model NS3, the system is configured into four modular memory cards, a timing and control card, an optional special features card and an optional custom interface card. Card size is the standard 11.75 in. by 15.4 in.

Each memory card has a maximum capacity of 32K by 22 bits (64K bytes). The cards can be modified to meet the requirements of individual systems. Storage capacity is adjusted through board depopulation.

The basic storage element is NSC's Model MM5270 4K dynamic random-access memory (RAM) which permits all levels to be compatible with those of bipolar TTL devices, the firm said.

Optional features include custom interfacing, byte control, error check and correction (or parity) and double word control with a word structure of 44 bits. A remote self-test unit which exercises the system is available as an option.

Modes of operation include Write, Read and Read-Modify-Write. Access time is 280 nsec, and cycle time for either the Read or Write mode is said to be 430 nsec. The Read/Modify/Write cycle takes 610 nsec plus the time needed by the user's equipment to modify the data.

Memory refresh can be implemented for individual applications either in a synchronous mode or an asynchronous mode, allowing "hand shaking" with the central processing unit, the firm said.

The price of a full NS3 system with a chassis, 128K by 22-bit organization and power supply is $11,000, available from 2900 Semiconductor Drive, Santa Clara, Calif. 95051.

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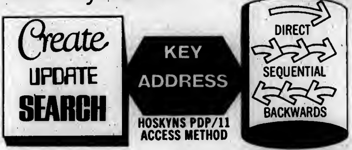
SPECIFIC FONTS ______
☐ TYPEWRITER ☐ PRINTER ☐ EMBOSSER

We **Build** Computer Systems . . .



We build, or help build, computer systems. At one exteme we take full project responsibility: at the other, we provide a programmer or analyst—on a daily basis—to augment your team. However we fit in, we all work in a systematic manner. We use leverage tools. And we try **to make things a little better.** For example, our Hoskyns Access Method for Digital Equipment Corporation's PDP/11 Series is a superior indexed sequential data base facility:

. . . from Original Designs . . .

We build custom systems from client specifications or including design. At $4 to $6 per COBOL statement (versus a $6 to $10 in-house average), we may not save all that much money. But we do provide schedule flexibility, specialist skills and **assured results in demanding situations**. The system sketched in the box (we carried full project and technical responsibility) illustrates our capability:

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- 24 hour service

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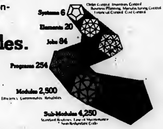
We build custom systems and we build systems based on our off-the-shelf Modular Application Systems (MAS) modules. Either way, the systems come out **exactly to your specification**:


Systems 6
Order Control Inventory Control
Business Planning Manufacturing Control
Financial Control Cost Control
Elements 20
Jobs 84
Programs 254
Modules 2,500
Sub-Modules 4,250

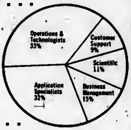
You Get a Quality Job . . .

However we build the systems, our approach is careful and conscientious. We work to fixed price, performance and delivery contracts. We provide a free maintenance period. We design robust systems **to produce results** in the real world:

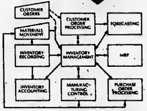
SYSTEM CHARACTERISTICS	PROGRAM ATTRIBUTES	MMDS TOOLS
Convenient Input/Ouput Operability/Recovery Audit Trail/Error Control	Testing Implementation Alteration	Systems Analysis Language Decision Table Processor Modular Programming Test Harness

You Get Responsible People . . .

Our people are responsible professionals. Our approach is a modest, cautious one: a systematic method, use of leverage tools and a **respect for individual ability**. As a company, we provide well thought out products and services in a reliable and economic way. We now have 1200 staff members and sales in excess of $40M p.a.



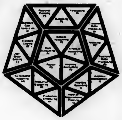
You Get MAS Integration . . .



MAS offers meticulous fit, immaculate finish and demonstrable performance at miniscule cost. If that's not enough, MAS allows you to build a **totally integrated system**: piece by piece, in any sequence, with the certainty that it will all fit together. Take the MAS inventory Control links:

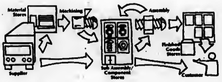
And You Get MAS on RJE

If you need computer power as well as computer systems, MAS on RJE is a five star service. The **MAS systems cost you nothing** through one of our RJE terminals installed in your office. You pay only for set-up, and any tailoring or implementation you may elect to have done. That's it. At no cost you have unrestricted access to the complete range of MAS systems. The RJE running charges are modest.



MAS Tailored Fit . . .

Where MAS can be used, you get a system to your exact specification with a finish better than custom. Only by spreading the cost of detailing over many users can such refinement be afforded. And **MAS fits better than custom**. Take inventory control as an example. MAS models the complete inventory situation: resources and movements. Because it accurately reflects the real situation, it can always be tailored to fit individual requirements. And, because it's built to flex, MAS continues to fit your developing needs:



$1 per Program Statement . . .

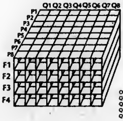
	High	High	Low	Low
Cost/ Man Month*	$2 400	$4 000	$1.440	$2.400
Statements/ Man Month	240	400	240	400
$'s/ Line	$ 10	$ 10	$ 6	$ 6

*Includes Fringes Training Machine Time

With COBOL code averaging $6 to $10 per line, MAS costs less than $1 per immaculate statement—standard. **Tailored to include special facilities**, it isn't likely to reach $2 per line. The $6/$10 norm? As follows:

Proven Performance . . .

Over 550 MAS systems are now in use—worldwide. You can see them working, study the documentation and **see the results produced**. So you know that there's no risk and the performance is proven. And you'll appreciate the refinement that comes with experience. For example, the MAS Inventory Control System provides a complete spectrum of inventory policies:



ORDER POINT
P1 Calculated From Service Level
P2 Calculated From Safety Factor
P3 Calculated From Safety Period
P4 Out Of Stock
P5 Back Order
P5 Fixed Quantity
P7 Individual Period
P8 Intermittent Period

FORECASTING
F1 Single Level Exponential
F2 Exponential Plus Trend Correction
F3 Statistical Plus Management Supplements
F4 Manual

Note: All of above may be order or usage based; and include consistency and responsiveness checking.

ORDER QUANTITY
Q1 Economic Batch Quantity
Q2 Part Period Balancing
Q3 Discrete Orders
Q4 Fixed Quantity
Q5 Jobbing Orders
Q6 Discrete Period Cover
Q7 Multiple Period Cover
Q8 Replenishment

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We run systems for clients: as a **supplement** to the use of in-house facilities, as an **alternative** to acquiring a new computer, or as a **replacement** for an old one. Client facilities and our central computers are linked by a nationwide network:

. . . on IBM 370/168 Computers . . .

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370/168 · 360/50
370/145 CDC 6500
370/155 EAI 8400
DISKS:
2314, 3330 - single and double density
Drums, Magnetic Tapes, Plotters, Microfilm

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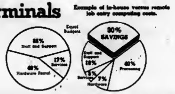
SVS/HASP
OS/MVT/HASP
DOS DOS/VS
Emulation Assembler
COBOL-ANS FORTRAN
PL/I RPG SNOBOL
Application Software
Scientific Software

We use large, **economy of scale**, IBM 370/168 computers at our centers, with smaller IBM computers tied in as satellite stations. You have as much, or as little, local processing power as you wish. Planned overload is floated back to the versatile /168's:

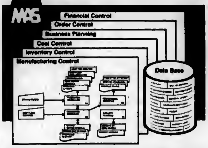
. . . through RJE Terminals in Your Office.

Example of in-house versus remote job entry computing costs.



Most of our clients operate through Remote Job Entry (RJE) terminals installed in their offices. They get all the **convenience, responsiveness and control** of an in-house computer. Card readers, videos and printers (and, maybe local storage and processing power) are handled just as you would an in-house machine. Economy of scale and utilization makes for significant savings:

You Get Data Processing Professionalism . . .



With RJE Computing Power we like to work in a clean, transparent arrangement: it's effectively your own computer. But we know how to produce **systems that perform**, and we know how to manage a data processing activity successfully. So—if you can use our systems expertise, or our data processing methodology and tools—they're yours for the asking:

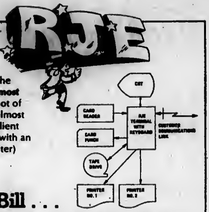
You Get Convenient Computing . . .

SECURITY	
FIELD	FUNCTION
Password I.D.	Jobs, data sets, libraries, programs
Account #	Protection hierarchy
Accounting I.D.	Cost control
Location	Protection hierarchy

PRIORITY	
CLASS	TIME INTO EXECUTION
I	Interactive
Q	0 minutes-15 minutes
O	15 minutes-1 hour
J	1 hour-4 hours
K	4 hours-12 hours

You run the RJE terminal just like your own computer. Passwords protect. **Priorities leave you in control.** The flexible configuration expands to handle your loads and contracts, when you don't need it, to save you money. You reach remote subsidiaries. And you have up-to-date software and complete technical backing.

The Elastic Configuration . . .



If you use an RJE facility, the most noticeable feature is the **almost limitless** power. The /168's do a lot of work in a hurry; and they have almost any capability you'd want. This client replaced an in-house computer with an RJE set-up (adding a second printer) while saving money:

The Shrinking Bill . . .

	BEFORE	AFTER
EQUIPMENT NO. JOBS/WK	360/50 2000	DATA 100 3000
NO. OPERATION SHIFTS	3/DAY, 7 DAYS/WK	2/DAY, 5 DAYS/WK
NO. DAYS TO CLOSE MONTH END	6	2
TOTAL COST	$75K/MONTH	$28K/MONTH

With RJE you **pay only for what you use.** You don't pay for a machine that's used 20 hours on one day per month—and 5 hours every other day. You don't configure your local machine for an extreme job that represents 5% of your load. And you know that every second of machine usage you save will come right off your cost. The economics for the configuration above:

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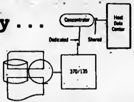
You Get RJE Flexibility . . .



With RJE you get limitless capacity, remarkable savings and state-of-the-art technology. So you're always **right up to date**. You avoid the inertia, the heavy system maintenace burden and the underutilization cost of your own facility. You get the benefit of the super configuration and powerful software. And you can mix-and-match economic local facilities with the central /168 resource (for peak loads, large jobs or special software work).

And You Get MAS on RJE ★★★★★

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Used Equipment Mart Called Best Bet for IBM Gear

By Mal Stiefel
Special to Computerworld

BOSTON – The used equipment market is the first place to look for IBM systems, peripherals and components, according to Gordon McAdams, DP operations vice-president for Investment Companies Services Corp., the DP subsidiary of Keystone Custodian Funds.

In a recent interview here, McAdams detailed some of his other observations as buyer and seller of used hardware, including:

- It is best to go through a broker rather than trying to deal with private parties directly.
- There's no need to pay full price from IBM if lower prices are available in the market.
- Some IBM deals on 370s can be more attractive than others because of shorter terms and more flexible leases.
- Brokers usually get about 5% commission on a sale.
- Some brokers are reliable; others aren't. The only way to find out is to try to do business with them.
- Inspect equipment, look at incident reports and get a certification letter from IBM regarding maintenance before any deal is closed.
- Get written quotes from brokers after sending them specifications; don't just make oral deals.

Keystone got its current 384K-byte 370/145 in the used equipment market along with earlier 360/40 (sold some time ago) and some add-on core memory for a 360/50.

The 360/50, bought from IBM, was sold through the used equipment brokers, as well as a 1410 system and several peripherals.

The company stayed with IBM in the 360 time period in the belief its hardware would maintain its value longer than that of the plug-compatible vendors.

But after equipment has been around awhile, McAdams said, users' needs change, so deals begin to appear. And it makes no sense, he went on, to pay full price from IBM if used equipment is available that can be acquired cheaper but still be maintained by IBM.

Why Brokers?

Why brokers instead of third-party leasing companies? Keystone has found dealers are invariably less flexible than the brokers and are unwilling, for example, to break up a system offered for sale as a package.

In such cases, the dealer might have trouble recovering costs on the remaining hardware once part of a system (usually the most desirable part) is sold.

Why then not go to private parties which advertise equipment for sale? Keystone tried this route, but found the offered equipment didn't quite meet its needs, he said.

Rather than compromise, it's found it can get exactly what it is looking for through the brokers, he said.

The brokers know what's available, where it is and who the customers are, McAdams said. Unfortunately, sometimes a broker will be selling something he doesn't have and hasn't the foggiest idea of how or where to get it.

To illustrate the point, McAdams told about his experience purchasing core memory back in 1973.

In response to a customer requirement (the company does a limited amount of specialized service bureau work for outside clients), Keystone decided early that year to add 128K of core by June 9 to the 360/50.

Core prices were dropping steadily that year, from $70,000 in January for 128K to less than $50,000 in June. IBM was offering the same core for $170,000.

Two weeks before the deadline, McAdams received two written quotations each for $43,000. One was from a dealer, the other from a broker. Then he began pressing for one-week delivery, since the deadline was fast approaching.

The dealer started stalling for time. It turned out, McAdams learned later, that it went into the marketplace itself as soon as it found out he was a serious buyer to get the core to deliver, but there was none to be had.

So the dealer tried to back out by hiking the price, disregarding its written quotation. Finally it admitted it couldn't help him.

At the same time, the broker said the core it had was "shipped to Europe yesterday," so it would have to get IBM to take the core out of another installation to send to Keystone. That would take 90 days.

McAdams began calling brokers again as soon as the situation became clear to him. But everyone he called already knew him, since the first two vendors had contacted everyone they could think of to try to make good on their quotea.

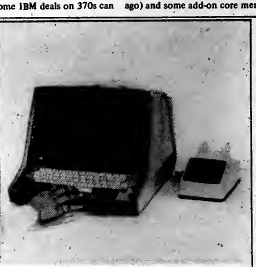
Next he found a broker in Washington which knew of a 360 in Hartford, Conn., with extra core which dould be removed by Computer Hardware Consultants and Services, Inc., a Newton, Pa., independent company that services IBM gear, as long as a customer for the Hartford 360 could be found.

There were two customers in Michigan who were looking for 360s, but that didn't work out. Now a week remained for Keystone.

Just then, McAdams contacted New York broker Harvey Berlent, who put him in touch with Comdisco in Chicago, which had access to a computer in New Jersey with extra core. Comma Corp. of New York, another independent maintenance organization, was called in to make the switch.

Comma removed the core on Friday, installed it in Keystone's computer in Boston on Saturday morning and the company ran with it that afternoon. The final price was $46,500.

Keystone later acquired its 370/145 as part of a deal which involved a Dallas broker and a company in St. Louis which had a computer in Portland, Ore., for sale or lease.



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Disks Unveiled at NCC

Peripherals Follow CPU Trend to Decreasing Costs

By Esther Surden
Of the CW Staff

NEW YORK – Mini makers, mainframers and independents alike brought disk drives to the recent National Computer Conference (NCC). The trend was toward lower cost, paralleling the decreasing cost of CPUs.

Control Data Corp. with its three disk products for minis, led the list of manufacturers introducing storage products.

The 9730 mini module drive is based on "Winchester technology" with a sealed module containing the disk spindle, recording media, rotary actuator and data recording heads, the firm said.

The unit stores 24M bytes of data and is "format- and interface-compatible" with the firm's 9760 series of OEM drives, CDC said.

The Module costs $3,020 in OEM quantities and will be available in the first quarter.

A medium-capacity, random-access storage device for OEMs, the CDC 9414 double-density fixed-disk drive provides 6M bytes and 12M bytes of data on one or two nonremovable disks.

Data is randomly accessible in an average of 65 msec; the read/write heads are positioned over the disks by a closed-loop proportional-servo system, the firm said.

Up to four drives can be operated by a single controller arranged in a daisy-chain configuration on the I/O channel, CDC said. The 6M-byte drive costs $1,695 and the 12M-byte drive costs $1,895 in OEM quantities. They will be available in the fourth quarter, CDC said.

A subsystem controlled by Intel's 8080 microprocessor was also introduced. The unit accommodates one or two floppy disk drives and was designed for incorporation into minicomputer systems.

The one-drive model costs $1,750 and the two-drive model costs $2,150 from the company in Minneapolis, Minn. 55440.

The Microdata Corp. Reflex disk drive also uses "Winchester technology" and features storage capacities ranging from 10M bytes to 50M bytes.

The unit is available in three versions with one, two or three disk platters.

The unit has a 30-msec average head-positioning time and a 6-msec track-to-track access time.

Reflex uses two heads per recording track. The drive transfers data at over 7 MHz, the firm said.

The single-disk version with 12M bytes of storage costs $2,400 while the three-disk version with 74M bytes of storage costs $3,600 and will be delivered in the first quarter.

Diablo Redesigns 44

An addition to Diablo Systems, Inc. disk drives, the 44B has the same specifications as the firm's earlier 44, but has been radically redesigned, a spokesman said.

The unit has an internal power supply; the electronics that were on 15 boards now are on five; the firm has moved to "ramp heads" and the system weighs 25 lbs less than the 44, a spokesman said.

The system costs $5,490 in single-unit quantities in comparision with $6,065 for the 44.

Diva, Inc. announced two disk drive offerings. The 50, designed for Digital Equipment Corp. PDP-11 users, features hardware compatibility and software transparency with the 50, Diva said.

The unit can hold 27.7M bytes unformatted with a 6-msec track-to-track access time, Diva said. Burst transfer rate is 806 kbyte/sec, it said.

The unit costs $13,600 with $200 monthly maintenance charge; a dual-drive version costs $19,600 with a $280/mo maintenance charge.

The DD40 series can be interfaced to the PDP-11, Data General Corp. Nova or Interdata minis, a spokesman said. It accommodates 100M bytes to 200M bytas of storage and uses the same controller on the 50.

The units range in cost from $24,000 to $28,000 from the firm at 607 Industrial Way West, Eatontown, N.J. 07724.

The 9000 Floppy disk system for minicomputers was introduced by Sykes Datatronics, Inc.

The microprocessor-based disk controller is contained on a single circuit board and performs all searching, data blocking, address verification and head loading.

The 9000 costs $2,800 for a single-drive system and $3,900 for a dual; computer interfaces cost $300, Sykes said.

An OEM Floppy System Kit consisting of a "smart" disk controller, up to four Sykes disk drives, interconnecting cable from the controller to the disk drives and a hardware interface to connect the system to microcomputers was also shown here.

The dual-density format controller writes 630K byte/diskette while an IBM-compatible format controller writes 256K byte/diskette.

The kit costs $1,398 in single quantities, Sykes said from 375 Orchard St., Rochester, N.Y. 14606.

GA Storage Modules Bow

General Automation, Inc. (GA) introduced a family of high-speed random-access disk storage modules (DSM), which includes a high-speed formatter which controls all data input and output from 40M-, 80M-, 150M- and 300M-byte disk drives.

Each formatter can support up to eight drives and data storage can be tailored from 40M bytes to 2.4G bytes, the firm said. The formatter provides a dual-port option to allow two systems access to all eight drives concurrently, providing re-

(Continued on Page 30)

Vendors Offer Printers, Tape Drives

By a CW Staff Writer

NEW YORK – Goodies at the recent National Computer Conference (NCC) included printers, tape drives and other products to make users' lives easier.

A family of OEM horizontal-font band printers, the 9830 series from Control Data Corp. operates at speeds of from 300- to 900 line/min, the firm said.

Print bands are available with 48-, 64-, 96- or 128-character sets. The printers adjusts to the size of the character set; operators can change bands without removing the print ribbon, the firm said.

The 300- and 600 line/min modes can print at 10- or 15 char./in., and standard letter-size paper is used when printing 15 char./in.

All models use common electronic and mechanical assemblies, the same print bands, ribbons and cabinets.

In OEM quantities the 300 line/min printer costs $4,000, the 600 line/min printer $6,000 and the 900 line/min printer $9,500, the firm said from Minneapolis, Minn. 55440.

Document/Passbook Printer

The Okidata document/passbook printer can be used with small business systems, according to a company spokesman. The unit, which reads 60 line/min and 110 char./sec, prints on single-part of multipart forms or horizontal or vertical passbooks.

The unit costs $3,000 in single-unit quantities, and delivery is 60 days, the spokesman said from 111 Gaither Drive, Moorestown, N.J. 08057.

An impact page printer capable of printing Arabic, Farsi and other languages and fonts utilizing interconnect characters is available from Dataproducts. It prints at a rate of 5-1/2 page/min or 300 line/min on 8-1/2-in. forms, the firm said. Dataproducts is at 6219 DeSoto Ave., Woodland Hills, Calif.

Diablo Adds 2320

The Model 2320 bidirectional matrix printer is an addition to Diablo's Hytype II printer family, the firm said.

The unit, which uses the same covers, positioning system and packaging as other Hytype II printers, prints at 200 char./sec.

The unit features horizontal and vertical tabbing, skip over space, incremental printing, upper- and lower-case 9 by 7 font, 132-column capability and an easy-to-change cartridge ribbon, the firm said.

The unit costs $1,740 in single-unit quantities or $1,450 in 100-unit quantities, Diablo said from 24500 Industrial Blvd., Hayward, Calif. 94545.

Epson Releases Printer

A low-speed 2610 line printer from Epson America, Inc. uses a belt-impact printing method, the firm said.

Low-noise printing at 150 line/min produces 64-char. sets in an 80-column format, the firm said.

The 256-character belt contains four sets of 64 characters. An optional belt provides the same character count in two sets of 128 characters, the firm noted.

The unit costs $900 in OEM quantities, the firm said from 2990 W. Lomita Blvd., Torrance, Calif. 90505.

Wangco Offers Carousel Printer

Wangco is offering the Interdata, Inc. Carousel printer to OEMs. In large volumes the printer will sell for less than $1,100, a spokesman noted from the firm at 5404 Jandy Place, Los Angeles, Calif. 90066.

An option that provides Interdata's Carousel printer users with the ability to plot computer-produced graphics is available for $195 from the firm.

A Carousel printer with the plotting option operates at 30 char./sec; the printer's 8-bit microprocessor enables the unit to determine a plotting location with a single character, the firm said.

The option including electronics and plotting print cup costs $195.

Gould Printer/Plotter

An electrostatic printer/plotter from Gould, Inc. Instrument Systems Division has interfaces for the Digital Equipment Corp. PDP-11, 2100 Hewlett-Packard Co. and Data General Corp. Nova/Supernova systems, the firm said.

The system prints 1,600 line/min with a 64-character set and plots graphics at a maximum speed of 3.25 in./sec. Resolution is 100 dot/in. overlapped, horizontal and vertical, it noted.

The plotter with print option is $7,560;

(Continued on Page 30)

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Array of Printers, Tape Drives on Display at NCC

(Continued from Page 29)

the plotter alone costs $7,060 from the firm at 3731 Perkins Ave., Cleveland, Ohio 44114.

The Unireel from Interdyne is designed to be a low-cost digital tape microperipheral, a spokesman said. It contains a single-reed magnetic tape package and a self-threading tape drive, he noted.

The package contains 150 feet of magnetic tape which can contain 140K bytes of data, according to the firm.

The drive threads the tape using no mechanically moving parts; the drive provides constant tape tension and dynamic control of tape motion during all modes of operation, the spokesman said.

The unit costs under $200 in quantities of 1,000; the media costs under $4 in quantity. Delivery is expected in the fall of '76, he said. Interdyne is at 14761 Califa St., Van Nuys, Calif. 91411.

The Micro Bus from Interdata is a programmable interface to the firm's 16-bit minicomputers. A maximum of four low-speed devices can be interfaced to the system through the bus which takes up a slot in the central processor.

The unit works with Interdata's 16-bit operating system and is based on Motorola's 6820 programmable interface, a company spokesman said.

The unit will make it easy for someone using microcomputers to interface with Interdata's mini, he added. No prices have been set on the unit, he noted from Oceanport, N.J.

Braemar Transport Unveiled

The CS-400 cassette tape transport system is designed for microprocessor use, according to Braemar Computer Devices, Inc.

The unit is TTL-compatible and accepts and delivers serial digital data at an 8K bit/sec rate.

The system has two-channel capability, and both tape tracks are available for data, with the active channel determined via TTL command, Braemar said. The user can write one track, switch channel, change direction and continue writing on the other track, it noted.

The system costs $350 in 1,000-unit quantities from Braemar at 11950 Twelfth Ave. South, Burnsville, Minn. 55337.

The NS-11 from National Semiconductor Corp. (NSC) is a 16K by 16-bit dynamic NMOS random-access memory (RAM) designed for use with the DEC LSI 11 microprocessor, the firm said.

The unit is based on the NSC NM5270 4K dynamic 18-pin RAM, the firm said. Each NLSI-11 card contains independent card select, timing and control circuits; addresses are jumper-selected from 0 to 32K in 4K increments, NSC said.

The memory costs $1,500 in quantities of one, a spokesman said from 2900 Semiconductor Drive, Santa Clara, Calif. 95058.

A militarized 3M Co.-type cartridge transport from Qantex Division of North Atlantic Industries, Inc. provides up to 23M bits of data storage on four tracks.

A combination of 1,600 bit/in. Ansi-compatible phase-encoded recording and 30 in./sec bidirectional tape speed allows the Model 700 to record and read at 600 byte/sec, the firm said.

The system costs $2,175 and may be purchased as a drive only, it noted.

Another Qantex offering, the Model 2710 portable digital cartridge recorder, also uses the 3M cartridge.

The recorder comes with interfaces to the PDP-11, LSI-11, Nova and the Intel 8080 microprocessor and includes power supplies, formatter and interconnecting cables, the firm said from 200 Terminal Drive, Plainview, N.Y. 11803.

Microdata's Lodestar offers 10M bytes of storage on a 3M-type data cartridge.

Prices of the system begin at $1,000 in 100-unit quantities, Microdata said from 17481 Red Hill Ave., Irvine, Calif. 92714.

PDP-11/70 Gets Add-On Memory

MINNEAPOLIS – Fabri-Tek, Inc.'s Model 7011 is an add-on core memory for the Digital Equipment Corp. PDP-11/70 system.

The memory is available in 32K-word increments with up to 1M words available. Complete electrical and physical compatibility with DEC's memory has been maintained, Fabri-Tek claimed.

A 128K memory, controller, chassis, power supply and cabling costs $18,250. Fabri-Tek is at 5901 S. County Road 18, Minneapolis, Minn. 55436.

Peripherals Follow Trend to Price Cuts

(Continued from Page 29)

dundant mass storage for distributed networks, it noted.

The units have an average access time of 30 msec, regardless of capacity, GA said, and users can select sector sizes from 8 words to 1K words.

The units range in price from $20,000 to $40,000, a spokesman said, and can be used with the firm's SPC 16/60, -65, GA 440 and GA 330 minis. Delivery is 30 days, the firm said from 1055 S. East St in Anaheim, Calif. 92805.

Persci Has All-DC Drive

Persci, Inc. introduced a dual diskette drive that the firm said is smaller in size than many single diskette drives and an "all DC" drive.

Two Model 270s with two read/write/erase head assemblies can be housed in a 19-in. rack; the diskette is IBM 3740-compatible and can accommodate 3.8M bits of data per drive, the firm said.

The disk costs $880 in 50-unit quantities.

The Model 70 all-DC diskette drive features voice coil positioning, which makes access time five to seven times faster than competitive drives, the firm claimed.

Track-to-track access time is 10 msec and average seek is 33 msec.

The drive is IBM-compatible, storing 1.9M bits of data in IBM 3740 format, Persci said. The unit costs $460 in 250-unit quantities. Persci is at 4087 Glencoe Ave., Marina del Ray, Calif. 90291.

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Kansas System an Example

Networks, Software Seen Touching Realm of Minis

By Esther Surden
Of the CW Staff

NEW YORK – Networking and software design were among the topics touched upon in a session on minis at the National Computer Conference here recently.

A network places a computer of any size where it can do the most good and then connects the nodes together, David L. Nordlund of the University of Kansas explained.

"If this is done right, the whole is greater than the sum of its parts," he said.

Nordlund gave as an example the network developed at the University of Kansas to handle the needs of the various scientific laboratories automated by the professors.

A rule of thumb, Nordlund said, is that when a professor puts a minicomputer in a lab, in a very short time the system must be expanded. Because of the money involved in this expansion, the university sought a better way to accommodate the professors' needs.

It considered connecting the laboratories with the university's mainframe, but dismissed that because the professors would have to relinquish control. On the other hand, the university felt it was losing control with the individual expansion of each system, Nordlund said.

Finally an idea for a network that would "semicentralize" activities was developed. A hub system of a Modular Computer Systems, Inc. mini was set up directly under the control of all the teachers and the various minis and microcomputers in the labs were connected to it.

The hub was then connected to a central system. Communications are facilitated via a dedicated high-speed system designed in-house, Nordlund said.

The network created a system "in which each node is contributing the ideal thing for that particular node," he said.

Device-Independent Support

Another issue examined in the session included the design of operating systems for minis. System support should be device-independent, according to Dennis M. Ritchie of Bell Laboratories.

"This is seldom achieved and is rather rare," he said.

When designing software to be device-independent, Ritchie said, it had best be done at a lower level rather than putting software on top of the operating system to make similar interfaces out of nonsimilar interfaces.

Advertisements "often brag about the number of files a system offers," he noted. "I think it is the job of an operating system to obliterate this difference between concepts."

File system designs should be developed to offer efficient random or sequential access to the same file no matter where it is located, he said.

The notion of records of files is not "a useful one," he told the group. "Records are a simulation of the 80-column punched cards," he said, and a "fixed-length record is an astonishingly inefficient way of storing records."

There are complexities involved in variable-length records as well, he noted, and it is easy to "botch this concept in some way."

Operating systems should be written in higher level languages that can be read, understood and modified to some extent, Ritchie said. Written this way, the system will be slightly larger than if it were in Assembly language, but "will be no slower," he said.

Probably the biggest savings in having the operating system written in a higher level language is that it can be very largely portable, he added.

Professional societies will have to distinguish in the future between recreational and professional computing, in the view of Robert F. Rosin of Iowa State University.

"We see amateurs using computer systems to do nothing," he said, adding this group will eventually have to be shaken out of the more serious endeavors of professional computing.

This is a function of minis becoming so inexpensive that many people with no computing background will have hands-on experience with minis, according to Robert D. Russel of the University of New Hampshire.

In fact, "the minicomputer will become, in the near future, part of all manufacturing processes," he said.

Since minis are highly visible, there is a danger their widespread use will have a "very dehumanizing effect" on workers, Russel said; by making the worker feel the decision-making power has been transferred to the computer.

The computing community must guard against this psychological problem through education, he said.

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Custom Systems Controllers Designed for DG, DCC Units

MINNEAPOLIS – Custom Systems, Inc. has a line of magnetic tape controllers for Data General (DG) and Digital Computer Controls, Inc. (DCC) minis.

The controllers will operate either NRZI or PE Tape Drives built by Wangco, Pertec and other manufacturers, the firm said.

The controllers are packaged with the board and all required cabling as well as a software diagnostic. Each costs $2,500 from the firm at Suite 170, 2415 Annapolis Lane, Minneapolis, Minn. 55441.

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Software Cited as Decisive Criterion in Mini Choice

By Esther Surden
Of the CW Staff

NEW YORK – "As you are going about trying to select a minicomputer, please ignore the hardware; it all does the same job.

"It's not how many index registers I have, but how much software development is available to me," Art Gravina of Cybek Corp., a New York turnkey vendor, told an audience at the recent National Computer Conference here.

Gravina was among a group of vendors and users speaking on "Using Minis in Large and Small Businesses."

Decision criteria in choosing a system must depend on the software, Gravina said. Whoever sells the system must provide adequate support, he added.

Ideal programming languages for minicomputers are not Cobol, Fortran or RPG because these languages were designed for batch systems and do not "fit into the scheme of a large number of on-line terminals," he said.

This notion is often very difficult to sell to management, he warned.

Minicomputers can be effectively used in large organizations, he told the group, citing installations at Seagrams, General Bakeries and Citibank.

"Citibank," he noted, "has made an internal decision that it no longer wants centralization." Each department head is entrusted with making the decision about which minicomputer to buy.

An example of a minicomputer installation in a large corporation, Citibank, developed to handle the processing of New York State income tax forms was described by Bob Weber of STC Systems. A basic function of the system is to open the returns and get the money in the bank, he noted.

The configuration includes a 256K-byte Data General Nova 8/30 with 40 CRTs and 400M bytes of disk on four spindles. A 600 line/min printer is also used with the system; an Interdata minicomputer acts as a controller for the disks, Weber said.

Some problems encountered with the system came from what manufacturers call "proven hardware" but is often "dead on arrival," he said.

Also, sometimes not enough time is left for testing. "The concept of programming on the truck has got to stop," he said.

On-line systems are more complex than batch systems, he noted, and problems to be solved through the system must be well-defined before implementation. A high level of specification detail must be developed for the system.

"Working with large companies is a zoo," he told the group. Although large companies don't try to "fight for the last dollar, there is tremendous cost in just getting the contract signed."

Minicomputer users look terribly naive to a manufacturer, Victor Poor of Datapoint Corp. said.

"A new or potential user asks all the questions the media has programmed him to ask," he told the group. The features users look for and the important features may be two different things, he noted.

"The average customer is preoccupied not with files, but with languages," he said. Users should ask what kind of file system a minicomputer has, whether the system can be upgraded to a large computer without a major hardware change, what the file access methods are and whether there is compatibility between the storage media.

A file structure should be transparent to the user. "You should know the files are there, but you shouldn't have to think about them very much," he said.

Files should be capable of being stored on more than one medium such as disk, floppy disk or tape, he said, with the original character of the file maintained. This is known as being isomorphic, he added.

Files should not be any more redundant than necessary, Poor said, and users should be able to access them on the basis of content.

At the moment data communications is a complicated process for users. This should not be so – "Communications should be as transparent to the user as files are," he told the group.

"It shouldn't be necessary to dial the phone or to watch the clock to make sure to do it only at a certain time," he added.

A system should also have its own data base related to the user's needs with the capability to access other systems, he said.

"And it shouldn't be necessary to have a host computer to access the systems," he noted. In host-free networks, systems can be expanded without much problem, he noted.

The ultimate hope for a minicomputer system is for the system to have the ability to exchange data on a completely transparent basis, he said.

CA Links Peripherals To Its LSI Family

IRVINE, Calif. – A DMA I/O Distributor for interfacing peripherals to Computer Automation, Inc.'s (CA) LSI family of minicomputers has been introduced by the firm.

The distributor enables up to four peripheral devices to access memory directly, with throughput of 250K byte/sec, without CPU intervention, CA said.

This eliminates the high cost of individual direct memory access (DMA) interfaces, increases I/O throughput and reduces computer overhead, a spokesman explained.

The distributor can be used in applications involving numerous slow- and medium-speed devices with the combined throughput exceeding a system's programmed I/O or interrupt bandwidth, the firm said.

Other high-speed devices such as magnetic tape or computer-to-computer communications can be supported where higher performance is required, CA said.

Low-speed peripheral devices can take advantage of the distributor's throughput without requiring new or additional software support, it noted.

The unit costs about $900 from the firm at 18561 Von Karman, Irvine, Calif. 92713.

Correction

The turnkey minicomputer for accounting and management information applications [CW, June 7] is available from Compumatics, Inc., 327 LaSalle St., Chicago, Ill. 60604.

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CIA Not Comforted by Description of SBS Intentions

By Molly Upton
Of the CW Staff

NEW YORK – The fears of the Computer Industry Association (CIA) were not allayed after hearing Philip N. Wittaker, president of Satellite Business Systems (SBS), describe his firm's business plans.

After his presentation to a recent CIA meeting here, the members indicated they were still worried about the possible impact on their businesses by SBS' plans.

SBS is a partnership venture owned by the subsidiaries of three firms: IBM, Comsat General Corp. and Aetna Life Insurance.

Two of the principal reservations of the CIA regarding those plans are SBS' relation with IBM and the possible prior knowledge by IBM of interfaces to the SBS system [CW, June 14].

Upon repeated questioning by Lester Kilpatrick, president of California Computer Products, Inc., Whittaker indicated some elements within IBM will know of SBS' interface plans prior to its filings with the Federal Communications Commission (FCC) since IBM, through its subsidiary, is an owner of SBS.

Also, attendees observed, IBM will be designing and building a portion of the ground stations.

"But it is in our best interest to tell the world what the interfaces are," Whittaker said.

He repeatedly assured the group it is SBS' intention to use interfaces that are widely used and are standards within the industry.

In establishing interfaces, SBS may consult with its parents as well as other firms, either in a group such as the CIA or individually, he said.

Whittaker also tried to put to rest fears that there will be some interconnection of IBM and SBS marketing forces. Neither firm, each with its own service and sales force, will sell, promote or give discounts. on the other's products, he said.

Whittaker also indicated he doubts very much if IBM intends to increase its share of SBS at any time in the future.

Targeted Customers

The customer set targeted by SBS is the top Fortune 500 firms, Whittaker said, and perhaps a few government agencies.

There will probably be fewer than 100 customers for the first five or 10 years, he said. The price advantages of SBS will become more evident in a multipoint environment, he added.

Jack Biddle, executive director of the CIA, commented that while Whittaker had "mentioned in passing" the SBS market was "only" the Fortune 500, in fact that represents 90% of the DP dollars.

Eventually, Whittaker said, he thinks value-added carriers may be customers of SBS.

He reiterated the assurances in SBS' latest filing with the FCC, which attempts to assuage FCC fears about interlocking connections with IBM by saying SBS will be operating at arms-length from the parent corporations.

However, since there is an initial funding of $55 million per partner, SBS will be consulting, with its parent firms on major decisions, technical expertise, advice and counsel, he said.

"We are going to operate on an independent basis, but the parents are not

(Continued on Page 36)

Adapso Calls for Worldwide Secretariat

By Molly Upton
Of the CW Staff

HEATHROW, England – National data services associations should band together to form an international secretariat or clearinghouse to keep the industry up-to-date on related activities around the world and to prevent firms from reinventing the wheel, according to Jerome Dreyer, executive vice-president of the Association of Data Processing Service Organizations, Inc. (Adapso).

The secretariat could save money for firms needing information on operations in various countries, Dreyer told the European Computing Services Association Conference on Small Business Computers and Telecommunications held here recently.

"If we accept the principle of multinational companies playing an even larger part in the world's economy, we in the computer services industry must be in the position of serving that key market. To succeed, in some part, will call for sophisticated data communications networks," he said.

Dreyer cited the need for more conformity in world communications standards: "As participants, we must move toward more uniform world communications standards that will streamline rather than impede international data communications," he said.

Worldwide Data Base

With the proposed secretariat, "relevant information on each country would be stored in a data bank available to member companies," Dreyer said.

The secretariat, funded by special assessments of the membership, could eventually become self-supporting by rendering services to nonmembers, he suggested.

"The American interest in a world DP secretariat is hardly born out of a narrow viewpoint," Dreyer said. "It is fashioned from a very realistic understanding of what can happen when there is an absence of order.

"Conversely," he added, "we would not want a single omnipotent body ever setting world DP standards; that could lead very rapidly in eight years to the very real Orwellian 'Big Brother' of 1984."

Dreyer noted the realities the U.S. DP industry faces in dealing with state and local agencies as well as federal agencies.

As indications of the increasing facilities, Dreyer said one U.S. firm has filed with the Federal Communications Commission (FCC) to become a value-added communications network service. This could establish a trend among other companies to become common carriers, he observed.

Another firm has requested FCC permission to provide packet-switching data communications service between the U.S. and the UK, he noted.

Dreyer also reviewed several areas of international scope in which Adapso is actively engaged. These include the area of electronic funds transfer systems which, he said, "is a key, in some ways, to many of the future national and international issues we as an industry will have to resolve.

"The so-called little black box, which could change financial and banking transactions, also has bearing on some other issues such as security and privacy, data and telecommunications," he said.

The two fastest growing areas of the services industry, software products and network information, are also those for which there is demand in the international realm, Dreyer said.

While revenues of the U.S. services industry are projected to grow from more than $4 billion in 1975 to $6.5 billion in 1980, network information should increase at 18% annually while software products' growth is projected at 26%. Traditional batch and contract software programming will grow at 8%, he said.

Analyst Says SBS Could Capture $1 Billion in Revenues by '90

NEW YORK – With a projected slice of the huge and quickly growing communications market, Satellite Business Systems (SBS) could reach $1 billion in revenues by 1990, according to Harry Edelson, senior computer industry analyst with Drexel Burham Co.

No company has shown such an increase in revenues within 10 or 11 years of its founding, he told a recent meeting of the Computer Industry Association (CIA).

SBS has a chance to be the biggest success at increasing revenues in history, he remarked.

IBM, he added, will accrue benefits from the SBS offshoot through its interest in SBS and also as a supplier of at least half the value of the earth stations used by SBS.

IBM's venture in the satellite business is motivated by a look at the long range, he said. IBM is entering the communications industry to protect DP, which is married to communications, he said. Any DP firm must get into communications, he added.

The communications market, he observed, is much larger than the DP market. For instance, projections call for the communications industry, with revenues of around $95 billion, to be far bigger than DP by 1985.

And the communications supply industry, he said, ranks at $14 billion currently with growth projected to $50 billion by 1985, he said.

AT&T currently dwarfs IBM by almost any means of comparison, Edelson said. Bell has five times the fixed assets of IBM, three to four times as many employees and twice the revenues and net income, he observed.

Could Lower Phone Rates

Edelson feels SBS has great potential to lower telephone rates, thereby providing inexpensive communications. This means an increase in hardware, especially in distributed processing situations, he said.

Turning this attention to AT&T, Edelson observed the firm is taking an increasingly aggressive stance with the Federal Communications Commission (FCC) and seems, with its newer models of the Dataspeed 40, to be pushing one step at a time to see where the FCC will draw the line between computer and communications devices.

A 1956 consent decree holds that AT&T should restrict itself to the communications business and not participate in the DP business.

Right now the line is drawn between the Dataspeed 40 Model 3 and Model 4, but it is a fuzzy line, he said, adding he doubts if most of the CIA members know where the line is.

AT&T is increasing its competitiveness in the data area through other acts as well, such as its one-minute telephone

(Continued on Page 35)

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Two Seen as Financial Drain

NCC Exhibitors Applaud Concept of One Major Show

By Molly Upton
And Toni Wiseman
Of the CW Staff

NEW YORK – Nearly all of the exhibitors polled at the National Computer Conference (NCC) here liked the idea of one show a year rather than two.

Most indicated their reasons were that the drain on company resources would be too much and that two shows a year would dilute the concept of a major show.

In addition, several said in the CW survey they feel the rate of technological advance is not sufficient to warrant two shows a year.

A couple of respondents called for a show of three days' duration rather than four.

"I would much rather have one show than two," Tom Zmach, national sales manager for Anderson-Jacobson, Inc., said.

"I was in Atlantic City for three Joint Computer Conferences and by the third year the attendance was beginning to peter out. So I think having one big show a year as a focal point is the right idea, otherwise you won't get the attendance you want."

Zmach also observed that attending shows is expensive for the company and he would rather have an impressive 20-foot booth at one show than 10-foot booths at two.

Steven Elsner, Western region sales manager for Pertec Corp., expressed a preference for one show a year, three days long, with hours from 10 a.m. to 4 p.m., since he feels the floor is "dead" after 3 p.m.

Elsner agreed that the show is extremely expensive. "I don't think we gain that much from them," he added.

Regional shows give the company better exposure, he said, and companies can invite the people they really want to see in each area.

"There are other ways to skin a cat than NCC," he said.

Gabe d'Annunzio of Prime Computer, Inc., when asked if he would like two shows a year, said "Absolutely not." He cited the drain on resources of a company Prime's size and said he doesn't think there are enough new products in the industry to warrant two shows a year.

The crowds were good at New York, he said, but the costs were high.

A single major show has a focus that is appropriate, according to Bill Steinmetz of Four-Phase Systems, Inc. It would be somewhat detracting to have two major shows, he said.

A spokesman for General Automation, Inc. also said "absolutely not." There isn't enough time or money to support them, he said. estimating sizable booths at NCC would incur costs of about $100,000 when all the bills are in.

Two Shows 'an Overkill'

Tom Casalegno, group marketing communications manager for Hewlett-Packard Co., said he doesn't see any need for two such shows. "There are other markets we exhibit in that make sense also," he said, adding that two shows of this size a year "would be an overkill."

Gary Brunner, advertising manager for Harris Corp., said there might be a viability to two shows if the show attendance were between 40,000 and 50,000 in one show.

Don Cadieux, national sales manager of Computer Devices, Inc. said two shows a year would dilute the show.

Bob Schwartz of Amplex Corp. also said no to the idea of two shows a year, because, for the industry as a whole, one show a year is enough, he said.

Also, target dates for engineering tend to be set around a major show date, and two a year would interfere, he said.

"Two shows would have no purpose. If you're going to do it, you might as well do it big, in one centralized show," according to Bob Budenstein, director of marketing for Paradyne Corp.

"And a national show like this one, where a majority of exhibitors have concentrated their efforts, gives the public a good composite picture of what the in-

(Continued on Page 37)

$1 Billion Revenues Possibility for SBS

(Continued from Page 33)

rate, reduction of long lines rates and its backing of the Consumer Communications Reform Act, which Edelson termed a "pretty astounding" piece of legislation.

The one-minute telephone rate is really a data rate, in competition with the specialized carriers, he said.

The reduced long distance rates, whereby it is less expensive to call California than New Jersey from New York City, was a move in opposition to rates possible with satellites, which are distance-insensitive, he said.

At one point, Edelson said, he gave the Consumer Communications Reform Act a 50-50 chance of passing. But now, there are not enough days left in session for it to be passed this year, he said.

But a drawback, despite the massive effort AT&T is mounting for its passage, is that the bill has so many sponsors, Edelson doubts if any single version can get more than 10 or 11 votes. There are 150 representatives backing the bill and 11 senators, he said.

The bill essentially says competition is bad for AT&T so it should be allowed to buy up the competition, according to Edelson's interpretation.

He also observed the opponents to the bill seem to be disappearing from the scene on Capitol Hill.

One eventuality the FCC may have to face, Edelson said, is whether SBS would be in competition with AT&T if, for example, two large SBS customers decide to interconnect their lines.

Looking to other uses of the SBS system, Edelson said an IBMer has indicated the firm has a facsimile unit capable of transmitting a page in 3.5 seconds.

This capability could lead to use of facsimile to the point where the age of electronic mail is here, he said.

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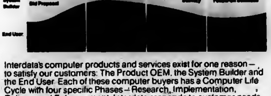

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Description of SBS Plans Fails to Assuage CIA Fears

(Continued from Page 33)

going to just throw money over the fence and not monitor the decisions we make," he said.

As an instance of its independence from IBM, one of the CIA members observed later IBM did not know Whittaker was meeting with the CIA.

IBM Motivations

When asked why IBM is entering this field, Whittaker indicated the motivation is not solely profit. Even if the profits from SBS are not substantial, IBM does have an interest in providing the capability, he said.

SBS feels the CIA and others should welcome the service it plans to offer since the speed and flexibility will offer opportunities for further expansion of the industry, he commented.

The SBS plan will also offer the capability of all-point switching including integrated voice, data and facsimile traffic, he said.

"We're not naive enough to think we can build a viable business on data alone. Our intention is to offer major corporate customers private line systems," he said.

Whittaker commented that, perhaps optimistically, SBS has estimated it will be given the green light by the FCC by the end of the year and have the system operational by mid-1979.

Ted Schurman, manager of systems and application requirements, said the scheme will allow SBS to reduce dependency on terrestrial facilities, to provide direct access, transmit at high speed and allow for efficient use of facilities by customers.

Also, it will encourage customers to use new facilities that they may have only been vaguely considering, he said.

In addition, the scheme will offer reconfiguration flexibility, he observed.

SBS' plan is to offer a service, not a set, of parts – "no tinker toys, no pieces, but a service," he told the CIA.

Ground stations are not for sale; they will be part of the service, he added.

In order for the customer to decide how to use the facilities extended him, the SBS service will include traffic statistics, traffic priority options and network status monitoring, he added.

Schurman said he feels the SBS filing may have created a wrong impression that much processing of data will be done at the earth stations. In fact, there is a minicomputer and a large memory; the data will not normally be looked at except for compression, he said.

SBS would be delighted to meet with members of the industry either as a group or individually and describe its plans.

"We do intend to keep the industry apprised of our activity, although our designs are not completely firm," he said.

Officer Says Basic/Four Systems Aimed at Unsophisticated Users

By Esther Surden
Of the CW Staff

IRVINE, Calif. – Basic/Four Corp. systems are designed for "environments hostile to high technology," Philip Davy, vice-president and group executive for Basic/Four, said in an interview here recently.

That is, the systems are designed for technically unsophisticated users and must be transparent to them, Davy said. "A system may be kept in a 120-degree loft, and the person operating it has to know if it is dead or alive. The machine has to be able to detect errors and tell the operator what to do."

A major thrust of the company for the future will be to give the user easier ways to use the systems and with no mistakes, Davy said.

"System crashes cannot be tolerated in the first-time user environment, he continued.

"We feel our primary advantage is that we pioneered" this type of small business system and have insight into the unsophisticated user's needs.

In the past most of the firm's effort has been toward "improving what we had – making it easier to program, less costly to program, more foolproof to operate." This will continue for the future as will providing more performance for the same price, he said.

The firm sells to the end user and guides the user to sources of application programs. All software is run on a Basic/Four system in the sales office before the system is installed at the customer's office, he said, to ensure that it runs well.

The firm anticipates some enhancements to the present product line in the future because "as our customers grow we don't want them to move up" to some other company, Davy said. However, the firm will clearly remain within the limitations of the unsophisticated user market, he added.

HP Head Advocates Free World Market

SAN FRANCISCO – Hewlett-Packard Co. (HP) Chairman David Packard advocated a U.S. foreign policy designed to "minimize the barriers to free trade around the world and to strengthen the concept of a free market."

In a speech before the World Trade Club here, he said: "It is clearly too much to expect that the people in government in the U.S. or in any other country can make the balanced judgments that will provide a near optimum outcome in the complex matters of world trade anywhere nearly as well as will the forces of the free market."

In addition, the next round of negotiations with free world trading partners on the subject of tariff and nontariff barriers will in some respects be more difficult than the Kennedy round, Packard said. This is caused by the increased competitive stance of the U.S.

HP's International orders last year exceeded domestic business, he said, adding he expects international business to grow more rapidly in the future than it has in the past.

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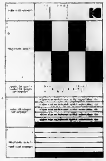

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Kodak people – working together to make COM work for you

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NCC Exhibitors Favor Concept of One Major DP Show

(Continued from Page 35)

dustry is like."

Two shows might be all right, but that means "you just about finish one and you're in the middle of preparing for another, Bill Leach, sales development manager for Datapoint Corp., observed.

About 40 companies had not been able to exhibit at NCC because booth space had been sold out, which might dictate two shows a year, Leach said.

"But, on the other hand, the problem could be solved by prohibiting really huge booths that take up so much floor space," he said.

Peter Johnson, market development manager for Basic Timesharing Corp. doesn't think business will support two shows a year.

"The combination of local exhibits such as the Computer Caravan and a major conference like NCC provides us with the best face-to-face opportunities for marketing," an Interdata spokesman said.

At the Dataproducts Corp. booth, Tom Livoti, 2290 product manager, said he would rather see one show a year, preferably outside the New York area where it is so expensive to set up.

Coping Financially

Joe Herman, manager of market promotion for data systems at Control Data Corp., said firms can't cope financially and physically with two shows a year. Two NCCs would be spread too thin, he said.

"There's also a question about being here," at NCC at all he said. But the attendees have been of good quality, he added.

But Joseph W. Gearty, marketing representative for Sycor, Inc., said he though the attendance warranted two shows. There should be a way to process more attendees, he said, since he felt some people did not come when they saw the lines down to 57th St.

It is the best of the computer shows, he said, adding he expects Sycor will need another show for future new products.

Such shows are valuable as they allow customers to become acquainted with new products, he said.

CMI to Supply CDC With CPUs

BEDFORD, Mass. – Cambridge Memories, Inc. (CMI) has signed a five-year contract to supply Control Data Corp. with its IBM 370/145-type CPU.

The agreement could be worth over $20 million to CMI, according to CMI President Joseph Kruy. The contract provides CDC with North American marketing rights for the product for five years.

CMI has design and manufacturing rights to the machine, which Kruy said is "in the 145 range."

The firm is currently in the production start-up phase and plans to deliver initial production units to CDC in the fourth quarter, he said.

Industry sources indicated the CMI machine is up and running and is program-compatible with the 145.

This is the second machine directly aiming at the IBM 370 market, following Amdahl Corp.'s 470V/6.

Calcomp Picks Canova President

ANAHEIM, Calif. – California Computer Products, Inc. (Calcomp) has named George M. Canova president, enabling Lester L. Kilpatrick to devote more of his time to the firm's antitrust litigation against IBM.

Canova has been executive vice-president of Calcomp for three years and was previously a founder and president of Century Data Systems, Inc., which was acquired by Calcomp.

Kilpatrick remains as chairman of the board and was elected chairman of a new executive committee of the board, which includes Canova; Walter F. Bauer, president of Informatics, Inc., and James W. Lewis, vice-president of Paine, Webber, Jackson & Curtis.

"For the past two years, I have devoted an increasing amount of time to directing the prosecution of Calcomp's antitrust suit against IBM, which is now set for trial in November of this year," Kilpatrick said.

"As a result, George has assumed more and more responsibility for the operations of the company. His election as president is formal recognition of these responsibilities. I will now be able to spend more of my time on the development and preparation of the lawsuit and on long-range corporate planning," he said.

Kruy Reassumes CMI Presidency

BEDFORD, Mass. – Joseph F. Kruy has reassumed the presidency of Cambridge Memories, Inc. (CMI) after a 1-1/2-year hiatus during which Jerry E. Goldress of Grisanti & Galef, Inc. held the position.

Goldress has resigned as a director as well, and John J. Coleman has joined the company as chairman of the operating committee.

"At the time Goldress was engaged as president, it was contemplated that his tenure would be of a temporary nature. The current realignment of the management is in keeping with those expectations," Kruy said.

Goldress was appointed in December after the firm incurred a $4.1 million loss in the year ended Aug. 31. During the recent second quarter the firm earned $54,000.

CA Cofounder to Resign

IRVINE, Calif. – Cofounder of Computer Automation, Inc. (CA), Emmons Miles, corporate vice-president and general manager of the firm's Naked Mini Division, said he intends to leave the company and the industry sometime during the next year.

Vice-President Stuart Dale has been named head of corporate product planning, and the former product planning director, Phil Kaufman, became director of engineering for the Naked Mini Division.

Brosnan Appointed Head of MSI

COSTA MESA, Calif. – MSI Data Corp. has appointed Donald F. Brosnan as president and chief operating officer. He succeeds William J. Bowers, who was named chairman of the board, and will continue as chief executive officer.

Frank A. Grisanti of Grisanti & Galef, Inc., formerly chairman of the board, will continue as a board member and has been named chairman of the executive committee.

Executive Corner

Ball Named to Post at HIS-Canada

WALTHAM, Mass. – Richard J. Ball has been named vice-president and general manager of Honeywell Information Systems (HIS) – Canada, succeeding Donald F. Brosnan.

Peter J. Sheridan was promoted to director of marketing operations, succeeding Ball.

Other Moves

- ■ John A. Pittman has been named vice-president of marketing and field operations for Storage Technology Corp.
- ■ Kenneth C. Brindle has been named vice-president of marketing for International Computer Negotiations, Inc.
- ■ Verdun Place has been appointed vice-president of Tri-Data Corp.
- ■ Roger M. Fisher has joined General Computer/Systems, Inc. as vice-president of marketing.
- ■ Donald R. Stroben, formerly acting president and chief executive of Computer Machinery Corp., has been named to Pertec Corp.'s board of directors.
- ■ Intertel, Inc. has appointed Harry S. Frandsen vice-president of finance.
- ■ Stuart F. Silloway has been named a director of Data 100 Corp.
- ■ William V. Schellinger has been named president of Program Products, Inc.
- ■ Charles A. Steinberg was named vice-president of audio-video systems and data products at Ampex Corp.
- ■ David M. Baker has been named vice-president of marketing at Magnetic Controls Co.

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FASB Modifying Draft on Leasing

STAMFORD, Conn. – The Financial Accounting Standards Board (FASB) said a number of modifications are being made to the exposure draft on accounting for leases.

All interested parties will have an opportunity to comment on the proposed changes prior to the issuance of a final statement later this year.

In formulating the modifications to be incorporated into the second exposure draft, the board has given careful consideration to 240 letters of comment it received, the spokesman said.

It has also had the benefit of a critique of the changes under consideration from the members of the former task force on accounting for leases, he added.

Adapso Sets Workshop on Mailings

MONTVALE, N.J. – The Association of Data Processing Service Organizations (Adapso) is sponsoring a direct mail workshop on Tuesday, July 13, at the Ramada Inn in Rochelle Park, N.J.

Topics Covered

The one-day workshop, in cooperation with the Direct Mail Marketing Association, will address such topics related to the computer services industry as postal and mailing regulations, how to develop and execute a direct mail campaign and how to coordinate the direct mail program with other parts of the total corporate advertising and sales/marketing program.

Cost to Adapso members is $85 and $125 for nonmembers. Adapso is at 210 Summit Ave., Montvale, N.J. 07645.

Correction

The Tally T1000 120 char./sec printer [CW, June 7] is manufactured in Italy under a license with Honeywell. Tally does not have a license to manufacture printers with General Electric.

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DIRECTOR OF COMPUTER SERVICES – Responsible for management (as well as the nuts and bolts operation) of Computer Services, including acct. management, personnel, planning, liaison with local & network committees, & maintenance of multiplexed communication. Computer Center has Harris COPE-1200 batch processing terminal with RJE access to IBM 370/158 OS-VS2 system & CDC-6600, & time-sharing access to DEC system-10 & CDC-6600. B.A./B.S., 3 yrs. exp. with computer operations, budget preparation, operational mgmt. is required. M.S. (in Computer Science or related field) or M.B.A. preferred. Sal. range: $15,500 - $17,000 for 12 months. On or before August 1. Send resume, references no later than July 6 to: Ms. Norma O. Goodwin, Personnel Admin., Indiana Univ. Southeast, 4201 Grant Line Road, New Albany, IN. 47150. Located in Louisville (KY.) Metropolitan Area. Indiana University is an Equal Opp./Affirm. Action Employer. All applicants will be considered without regard to race, sex, religion, national origin, age or handicap.

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Trade association seeks technical specialist with expertise and background in the business communications industry with emphasis on business forms and their related use in the computer field. The position requires a knowledge of product and hardware capabilities and a practical approach to the marketing significance of technical developments. Technical writing abilities necessary. Send resume and salary history to:

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Minimum qualifications: B.S. in Computer Science, Mathematics, or Physics: Experience in computer programming essential; emphasis on numerical applications and acquaintance with physics, chemistry, and cloud physics desirable. Salary: around $10,000. Dates: 1 Sept. 1976-31 Aug. 1977 (negotiable). Reply by 16 Aug. 1976 to J.L. Kassner, Jr., Cloud Physics Research Center, Univ. of MO-Rolla, Rolla, MO, 65401. *THE UNIV. OF MO IS AN EQUAL OPPORTUNITY EMPLOYER.*

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THE DEPARTMENT OF SYSTEMS ANALYSIS, Miami University, has a one-year position for a visiting assistant professor (with the possibility of the position becoming a tenured track position after one year). Candidates should have a broad applied computer science background and interest. Ph.D. preferred. Application to: Lawrence J. Prince, Chairman, Systems Analysis, Oxford, Ohio 45056. Miami University is an equal opportunity employer.

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Send resume in strict confidence To: AMCA International Corp., Suite 2904, 8100 Poplar, Memphis, Tenn. 38137.

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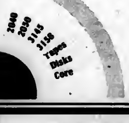

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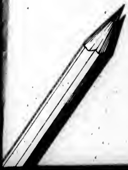

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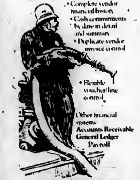

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Telex Triples Net on Small Sales Rise

TULSA, Okla. – With little increase in revenues, Telex Corp. managed to triple its income before special credits and show earnings of $6.6 million or 62 cents a share in the year ended March 31.

This compared with $1.4 million or 13 cents a share in the 1975 period.

Revenues remained nearly stable at $106.2 million compared with $106.1 million last year.

Income before special credits rose to $3.6 million compared with $1 million last year.

Although Telex Computer Products Group's revenues dipped to $78.6 million from $79.4 million last year, income before taxes turned around to $3.1 million compared with a loss of $1.3 million last year.

Telex Communications, Inc. had an excellent year, the firm said, with revenues of $27.6 million compared with $26.7 million last year. Income before taxes rose to $3.8 million compared with $2.8 million last year.

Inforex Earnings Rise Four Times Over Year-Ago Three-Month Period

BURLINGTON, Mass. – Inforex's first-quarter earnings rose more than four times to $353,000 or 12 cents a share compared with $79,000 or 3 cents a share in the year-ago period.

Income before special credits rose 10 times to $212,000 from $21,000. The special credits were $141,000 in the recent period and $58,000 in the year-ago quarter.

Revenues for the quarter ended April 2 grew to $14.9 million compared with $13.1 million in the same period last year.

Rental and service revenues jumped to $7.8 million compared with $6.7 million while sales rose to $7.1 million compared with $6.4 million in the year-ago period.

Results for the year-ago period have been restated to conform with accounting requirements for foreign currency translation gains and losses.

President Timothy C. Cronin said he was pleased with the firm's progress toward management's goals of controlling growth and improving profitability.

Lower interest expenses contributed to the improved profit margins, and further benefits were realized as costs and expenses in general were lower as a percent of revenues, the firm said.

Scan-Data Net Dives in Quarter

NORRISTOWN, Pa. – Although Scan-Data Corp's revenues rose during the first quarter, earnings plummeted to $16,528 or 1 cent a share compared with $76,133 or 4 cents a share in the same period last year.

Revenues rose to $3.3 million compared with $2.5 million in the 1975 quarter.

The disparity arose because the increase in revenues stemmed principally from field engineering services, which are not yet profitable, and from increased key entry system sales, which have a lower profit margin than the firm's optical character recognition (OCR) and mixed-media data entry systems, according to President Robert R. Burns.

In addition, lease revenues from revenue-earning equipment decreased from a year ago, although depreciation charges for this equipment have continued, he said.

Scan-Data expects to shortly begin shipments of its 2250/2 key entry system to the U.S. Marine Corps under a $4 million contract. The firm recently concluded successful benchmark testing of its software programs, it said.

AMS Scores Records In Half, Three Months

SUNNYVALE, Calif. – Advanced Memory Systems, Inc. scored record sales and earnings for the second quarter and half.

For the three months ended March 26, earnings rose to $1.4 million or 52 cents a share, including a tax credit of $651;000, compared with earnings of $439,000 or 18 cents a share in the year-ago period when there was a $210,000 credit.

Revenues for the second quarter were $9.9 million compared with $7.7 million for the same period last year.

For the six months, earnings totaled $2.5 million or 98 cents a share, including $1.2 million in tax credits, compared with $745,000 or 30 cents a share, including a $360,000 tax credit in the year-ago period.

Revenues for the six months were $19.6 million compared with $15.2 million for the first six months of fiscal 1976.

"AMS' operating performance and overall financial strength continued to improve during the second quarter," according to President Orion L. Hoch.

SEL Increases Loss In Nine-Month Period

FORT LAUDERDALE, Fla. – Despite third-quarter earnings of $158,024 or 6 cents a share, Systems Engineering Laboratories, Inc. (SEL) increased its loss for the nine months.

The earnings for the third quarter compared with a loss of $80,847 or 3 cents a share in the same period last year.

Revenues rose to $5.1 million compared with $4.2 million a year ago.

During the nine months, however, losses increased to $343;896 or 13 cents a share compared with $289,157 or 11 cents a share in the same period last year.

Revenues rose slightly to $13.7 million from $13.2 million in the year-ago period.

Tymeshare Net Up 46%

CUPERTINO, Calif. – Tymshare, Inc. reported a 46% gain in earnings on an increase of 31% in revenues for the first quarter ending March 31 over the same period last year.

Earnings rose to $1.6 million or 39 cents a share compared with $1.1 million or 29 cents a share in last year's quarter.

Revenues reached $18.4 million for the quarter, up from $14 million in the year-ago period.

Acquisitions

Comshare, Inc. has agreed to acquire Trilog Associates, Inc.'s Employee Benefits Services operation for 122,500 shares of Comshare common stock.

Trilog will become a wholly owned division of Comshare and will continue operations in Philadelphia under its current president, Donald J. Devine.

Meanwhile, **Pentamation Enterprises, Inc.**, a facilities management firm, acquired Trilog's DP facilities management services and systems engineering services operation for $643,050 in cash, based on inventory levels and certain expenses.

Tymshare, Inc. has agreed in principle to acquire Unitax, Inc. in an exchange of about 144,000 shares of Tymshare common stock with that of Unitax on a one-to-four share basis.

In another move, Tymshare has acquired the business and operations of Medical Data Systems, Inc. for 82,000 shares of Tymshare common.

E-Systems, Inc. has agreed to acquire NCR's wholly owned subsidiary, Electronic Communications, Inc. maker of communications products, for an undisclosed amount of cash.

Caesars World, Inc. has acquired 79.6% of the outstanding stock of Ontel Corp. maker of intelligent CRT systems.

Commercial Credit Corp. has completed the acquisition of Guld Insurance Unit of Wyly Corp.

Centronica Data Computer Corp. has acquired Romark Machine Co., Inc. a supplier to Centronics of precision machined parts, for 31,000 shares of Centronics common stock.

Logical Services, Inc. has acquired Creative Computer in order to strengthen its software capability. Logical makes microcomputers; Creative supplies software and educational material.

DP Services, Inc. has acquired American Guardian Computer Service, Inc.

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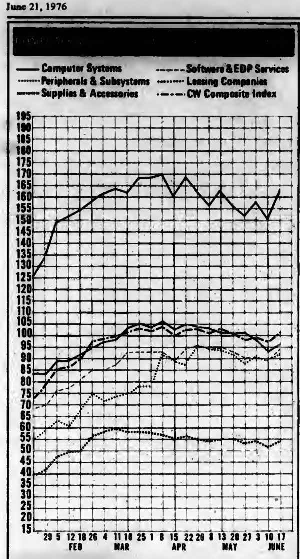

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Revenue	61,910,000	49,275,000
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Three Months Ended March 31

	1976	1975
Shr Ernd	$.42	$.28
Revenue	3,540,403	3,127,721
Tax Cred	245,000	192,000
Earnings	573,338	376,028
9 Mo Shr	.72	.86
Revenue	10,215,496	8,767,780
Tax Cred	442,000	565,000
Earnings	977,618	1,164,039

CUBIC
Three Months Ended March 31

	1976	1975
Shr Ernd	$.47	$.15
Revenue	23,807,400	20,538,100
Earnings	1,034,400	340,000

DIGITAL EQUIPMENT
Three Months Ended March 27

	1976	1975
Shr Ernd	$1.53	$.95
Revenue	191,234,000	134,642,000
Earnings	18,922,000	11,329,000
9 Mo Shr	3.83	2.39
Revenue	504,293,000	373,232,000
Earnings	46,586,000	28,560,000

CALIFORNIA COMPUTER PRODUCTS
Three Months Ended March 28

	1976	1975
Shr Ernd	$.11	.....
Revenue	30,667,000	$26,210,000
Earnings	356,000	(4,618,000)
9 Mo Rev	88,817,000	90,956,000
Loss	2,736,000	3,567,000

CINCINNATI MILACRON
Three Months Ended March 31

	1976	e1975
Shr Ernd	$.41	$.79
Revenue	106,173,006	109,279,000
Earnings	1,540,000	2,911,000

e-Restated to reflect accounting change in translating foreign currency.

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Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, JUNE 16, 1976

All statistics compiled, computed and formatted by TRADE★QUOTES, INC. Cambridge, Mass. 02139

CONPUTFR SYST2NS

EXCH		PRICE 1976 RANGE (1)	CLOSE JUN 16 1976	WEEK NET CHNGE	WEEK PCT CHNG2
N	BURROUGHS CORP	84-108	99 7/8	+5 7/8	+6.2
O	COMPUTER AUTOMATION	10- 19	13	+1 1/4	+9.0
N	CONTROL DATA CORP	18- 27	22 1/4	+2 1/4	+11.2
N	DATA GENERAL CORP	40- 63	52 1/8	+3 1/2	+7.1
O	DATAPOINT CORP	24- 45	41 3/4	+5 1/2	+13.1
O	DIGITAL COMP CONTROL	2- 5	4 7/8	+1 1/N	+30.0
N	DIGITAL EQUIPMENT	138-181	164 1/4	+8 1/8	+3.2
N	ELECTRONIC ASSOC.	2- 3	3 1/N	+ 1/R	+4.1
A	ELECTRONIC ENGINEER.	7- 16	11 3/8	+1 1/8	+10.7
N	FOXBORO	28- 45	45	+4 1/2	+11.1
O	GENERAL AUTOMATION	5- 11	7 1/4	+ 1/2	+7.4
O	GRI COMPUTER CORP	1- 1	5/R	0	0.0
N	HEWLETT-PACKARD CO	93-117	111 3/8	+6 3/4	+6.4
N	HONEYWELL INC	34- 36	47	+4 1/4	+9.9
N	IBM	227-272	262 1/2	+9 1/4	+3.6
O	MANAGEMENT ASSIST	1- 3	1 7/R	0	0.0
O	MEMOREX	18- 33	29 1/2	+5 1/2	+22.9
O	MICRODATA CORP	10- 26	21 7/8	+2 1/2	+12.9
O	MODULAR COMPUTER SYS	9- 13	13 1/4	+1 3/4	+13.2
N	NCR	24- 32	32 1/4	+1 1/2	+4.8
O	PRIME COMPUTER INC	4- 11	R 3/4	+ 1/2	+6.0
N	PERKIN-ELMER	19- 27	21 1/4	+ 3/4	+3.6
N	RAYTHEON CO	45- 60	59 T/R	+4 1/4	+7.6
N	SPERRY RAND	40- 30	48 7/8	+2 1/4	+4.8
O	SYCOR INC	20- 51	25 1/2	+1 1/2	+6.2
A	SYSTEMS ENG. LABS	6- 13	8	- 1/R	-1.5
N	VARIAN ASSOCIATES	13- 17	14	+ 3/8	+4.6
A	WANG LABS.	11- 20	12 3/8	+1	+8.6

L2ASING COMPANIES

EXCH		PRICE 1976 RANGE (1)	CLOSE JUN 16 1976	WEEK NET CHNGE	WEEK PCT CHNG2
O	CCPOISCO INC	3- 10	6	+ 3/4	+14.2
A	COMMERCE GROUP CORP	2- 3	2 5/4	+ 3/N	+13.7
A	COMPUTER INVSTRS GRP	1- 3	2	+ 1/R	+6.6
N	DATRONIC RENTAL	1- 1	1 1/4	+ 1/8	+11.1
A	DCL INC	1- 1	5/4	0	0.0
N	DPF INC	5- .T	6 1/R	+ 1/2	+8.8
A	GREYHOUND COMPUTER	3- 8	7 1/8	+ 1/8	+1.7
N	ITEL	6- 13	11 1/4	+ 1/4	+2.2
N	LEASCO CORP	6- 14	11 5/R	+ 3/8	+5.6
O	LEASPAC CORP	0- 1	1/4	0	0.0
O	NRG INC	0- 1	3/8	- 1/8	-23.0
A	PIONEER T2X CORP	6- 9	6 7/8	- 3/8	-3.1
N	U.S. LEASING	7- 12	9 1/2	+ 3/4	+8.3

2RCH: N=NEW YORK; 6=RMERICAN; P=PHIL-BALT-WASH
L=NATIONAL; M=MIDWEST; O=OVER-THE-COUNT2R
O-T-C PRICES ARE 8IO PRIC2S AS OF 3 P.M. OR L6ST 8IO
11T TO NE6R2ST DOLL6R

SOFTWARE & EDP SERVICES

EXCH		PRIC2 1976 RANG2 (1)	CLOSE JUN 16 1976	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED COMP TECH	1- 2	1 5/8	+ 3/8	+30.0
O	ANACOMP INC	9- 11	R 3/4	- 1/4	-2.7
6	APPLIED DATA RES.	2- 3	2 3/4	+ 1/R	+4.7
N	AUTOMATIC DATA PROC	54- 69	68	+2	+3.0
O	COLEMAN AMERICAN COS	4- 6	3 1/2	0	0.0
O	COMPUTER DIMENSIONS	3- 7	4 3/4	0	0.0
O	COMP ELECTION SYSTMS	5- 9	7 1/2	- 3/4	-9.0
O	COMPUTER HORIZONS	1- 2	1 1/2	+ 3/4	+100.0
O	COMPUTER NETWORK	2- 6	3 5/8	- 3/8	-9.3
N	COMPUTER SCIENCES	4- 8	6 1/R	+ 1/4	+4.2
O	COMPUTER TASK GROUP	1- 1	1 3/8	0	0.0
O	COMPUTER USAGE.	3- 6	5 5/8	- 1/4	-6.4
O	CONSHARE	2- 9	8 3/4	+1	+12.9
O	DATA DIMENSIONS INC	2- 4	3 3/4	+ 1/2	+13.3
O	DATATAB	1- 1	1	0	0.0
N	ELECTRONIC DATA SYS.	12- 16	15 3/8	+1 3/4	+14.7
O	INFONATIONAL INC	1- 1	1/N	0	0.0
O	INSYTE CORP	1- 3	1 7/8	- 3/8	-16.6
O	IRS COMPUTER MARKET.	1- 2	1 1/R	+ 1/8	+12.3
O	KEANE ASSOCIATES	2- 4	3	0	0.0
O	K2YDATA CORP	3- 3	2 5/8	0	0.0
O	LOGICON	4- 4	5 3/4	0	0.0
A	MANAGEMENT DATA	1- 3	2 1/8	- 1/8	-5.5
A	NATIONAL CSS INC	13- 25	19 7/8	+1 3/8	+7.4
A	ON LINE SYSTEMS INC	18- 22	18 1/4	+ 3/8	+2.0
N	PLANNING RESEARCH	3- 5	3 1/4	0	0.0
O	PROGRAMMING & SYS	1- 1	1/2	0	0.0
O	RAPIDATA INC	3- 3	2 3/4	+ 1/8	+4.7
O	REYNOLDS & REYNOLD	13- 21	17 1/2	+ 1/2	+2.9
O	SCIENTIFIC COMPUTERS	1- 1	3/4	0	0.0
O	TYMSHARE INC	19- 28	23 1/8	+1 3/8	+6.9
A	URS SYSTEMS	3- 3	5 5/4	- 1/R	-3.2
N	WYLY CORP	5- 7	3	0	0.0

PERIRHERALS & SUBSYSTENS

EXCH		PRIC2 1976 RANG2 (1)	CLOSE JUN 16 1976	WEEK NET CHNGE	WEEK PCT CHNGE
N	ADDRESSOGRAPH-MULT	8- 13	9 1/4	+ 1/2	+3.7
O	ADVANCED MEMORY SYS	4- 10	R 1/4	+1 1/4	+17.5
N	AMP2X CORP	5- 8	7 3/8	+ 3/8	+5.1
O	ANDERSON JACOBSON	2- 4	2 3/4	- 1/4	-8.3
O	APPLIED DIG DATA SYS	13- 23	24	+ 1/2	+2.1
O	BEEHIVE MEDICAL ELEC	3- 9	8 1/2	+1	+13.3
6	BOLT,BERANEK & NEW	7- 10	R 5/R	+ 3/8	+4.3
N	BUNKER-RAMO	5- 7	7 1/4	+1 3/8	+23.4
6	CALCOMP	4- 7	4 1/2	0	0.0
O	CAMBRIDGE MEMORIES	2- 6	2 1/2	- 3/8	-20.0
N	CENTRONICS DATA COMP	20- 36	32	+2 1/8	+7.1
O	CODEX CORP	22- 42	34 1/2	+4 1/2	+15.0
O	CCONITRONICS	1- 1	7/8	0	0.0
O	COMPUTER COMMUN.	1- 5	3 1/2	- 1/8	-5.4
O	COMPUTER CONSOL2S	4- 7	6 1/4	0	0.0
A	COMPUT2R 2QUIPMENT	1- 3	1 3/4	0	0.0
O	COMPUTER TRANSCEIVER	1- 5	1 1/4	+ 1/8	+11.1
O	CONTEN	4- 9	7	+ 5/4	R12.0
N	CONRAC CORP	20- 29	25 1/8	+2 3/8	+12.8

EXCH		PRICE 1976 RANGE (1)	CLOSE JUN 16 1976	WEEK NET CHNGE	WEEK PCT CHNGE
O	DATA ACCESS SYSTEMS	1- 4	3 1/2	0	0.0
O	DATA 100	7- 13	9 5/R	- 1/4	-2.5
A	DATA PRODUCTS CORP	5- 11	R 3/4	+ 1/2	+3.4
O	DATA TECHNOLOGY	1- 2	1 3/R	- 1/R	-8.3
O	DATUM INC	1- 2	2 1/8	0	0.0
O	DECISION DATA COMPUT	1- 4	2	+ 1/8	+6.6
O	DELTA DATA SYSTEMS	1- 1	5/R	0	0.0
N	ELECTRONIC M & M	1- 3	2 3/8	0	0.0
O	FABRI-TEK	1- 1	3/4	0	0.0
O	GENERAL COMPUTER SYS	1- 2	1	0	0.0
N	HAZELTINE CORP	4- 12	9 3/4	+ 1/2	+5.4
N	HARRIS CORP	34- 48	46 1/4	+1 3/4	+3.9
A	INCOTERM CORP	9- 20	11 5/R	+1 3/4	+17.7
O	INFOREX INC	3- 7	4	- 3/8	-8.5
O	INFORMATION INTL INC	10- 18	14 1/8	+ 1/2	+3.6
O	INTEL CORP	63-109	6T	+1	+1.5
A	LUNDY ELECTRONICS	4- 7	3 7/8	0	0.0
O	MSI DATA CORP	3- 7	6	+ 1/2	+9.0
A	MILGO ELECTRONICS	15- 21	20 3/8	+ 7/R	+4.4
N	MOHAWK DATA SCI	3- 7	6 7/8	+ 5/8	+10.0
O	PENRIL CORP	1- 3	1 7/8	- 1/4	-11.7
A	PERTEC CORP	3- 8	5 1/4	+ 1/4	+5.0
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
O	PRECISION INST.	7- 19	3	0	0.0
O	QUANTOR CORP	4- 3	4	0	0.0
O	RECOGNITION EQUIP	6- 11	8 1/4	+ 1/4	+3.1
N	SANDERS ASSOCIATES	6- 11	9 3/8	+ 3/R	+7.1
O	SCAN DATA	2- 4	2 1/4	0	0.0
O	STORAGE TECHNOLOGY	9- 13	11 1/8	+ 3/8	+3.4
O	T BAR INC	5- 10	5 1/8	+ 1/4	+5.1
O	TALLY CORP.	4- 6	5 1/4	+ 1/N	+2.4
O	TEC INC	3- 5	3 3/4	0	0.0
N	TEKTRONIX INC	45- 63	37 3/8	+1 3/5	+2.A
N	TELEX	2- 5	3 3/8	+ 1/8	+3.3
O	WANGCO INC	11- 22	18 1/8	+ 1/R	+0.6
O	WILTEK INC	2- 2	2	0	0.0

SUPPLIES & ACCESSORIES

EXCH		PRICE 1976 RANGE (1)	CLOSE JUN 16 1976	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED SYSTEMS INC	1- 4	2 1/4	0	0.0
O	BALTIMORE BUS FORMS	4- 3	5 5/4	- 1/4	-6.2
A	BARRY WRIGHT	6- 10	7 3/R	- 3/R	-4.6
O	CYBERNATICS INC	1- 1	7/8	+ 1/8	+16.6
A	DATA DOCUMENTS	33- 42	33 1/4	+ 1/4	+0.7
O	DUPLEX PRODUCTS INC	13- 24	15	+ 1/4	+1.6
N	ENNIS BUS. FORMS	6- 8	6 7/8	+ 1/R	+1.8
O	GRAHAM MAGNETICS	8- 13	8 1/4	0	0.0
O	GRAPHIC CONTROLS	13- 19	14 1/4	+ 1/4	+1.7
N	3M COMPANY	33- 65	56 1/8	+3 3/3	+6.9
O	MOORE CORP LTD	41- 51	41 3/4	+ 1/4	+0.6
N	NASHUA CORP	11- 17	14 7/8	+ 1/8	+0.8
O	STANDARD REGISTER	16- 19	16	0	0.0
O	TAB PRODUCTS CO	5- 9	8	+1 1/4	+16.1
N	UARCO	21- 25	21	- 1/4	-1.1
O	VANIER GRAPHICS CORP	5- 8	6 1/2	+ 1/N	+1.9
A	WABASH MAGNETICS	4- 8	6 1/8	0	0.0
N	WALLACE BUS FORMS	19- 25	20	+ 1/4	+1.2

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